

COMMUNICATIONS RECEIVER  
TYPE RA.17L

Operating and Maintenance Instructions

Technical Handbooks Department

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Front view of Receiver Type RA.17

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THE RACAL COMMUNICATIONS RECEIVER  
TYPE R.A.17

**PART 1**  
**TECHNICAL DETAILS**  
**AND**  
**OPERATION**

# PART 1

## TECHNICAL DETAILS AND OPERATION

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# SECTION 1

## INTRODUCTION

### 1.1 GENERAL DESCRIPTION

The Communications Receiver Type RA.17 has been designed for use as a general purpose receiver which will provide a high order of sensitivity, selectivity and stability. The receiver covers a frequency range from 1.0 to 30.0 Mc/s and extending, with slightly degraded performance, down to 500 kc/s.

A built-in crystal-controlled calibrator provides reference signals at each 100 kc/s division to permit exact alignment of the scale pointer. Two independent i.f. outputs, in parallel, at 100 kc/s are provided for external use if required. A number of audio outputs are available providing flexibility during operation; a small loudspeaker is fitted for monitoring purposes.

The receiver is designed to operate from 100–125 volts and 200–250 volts, 45–65 c/s mains supply. The power consumption is approximately 100 watts.

### 1.2 NORTH AMERICAN VERSION

North American versions of the RA.17 receiver are identical to the Standard model but include minor variations in detail to comply with North American practice. Certain tubes are changed to ensure that the set employs types commercially available in North America; this entails slight circuit changes to allow for differences in the tube operating voltages. The level meter circuits are modified to include a calibrated "S" meter range. The a.f. output stage is modified to give a maximum output of 1 watt. Coaxial connections are changed from British to North American standards and the supply connection comprises a lead directly connected to the set in place of the fixed plug and free socket fitted to the British version.

These instructions cover both types of receiver. Where applicable, attention is drawn to the differences between the two versions.

### 1.3 CONSTRUCTIONAL DETAILS

The receiver is designed for both bench (table) and rack mounting. The front panel is painted Light Battleship Grey (British Standard Specification 381C, colour 697) and has been carefully designed to minimise operator fatigue.

The dimensions of the  $\frac{1}{8}$ -in. thick front panel conform with the requirements for mounting in a standard 19-in. rack.

For bench mounting, the receiver is fitted in a robust steel cabinet which has a rear opening to enable the operator to gain easy access to the power input socket (Standard version only), the fuses and the termination strips.

A dust cover is provided with both models. This may be removed from cabinet-mounted receivers in conditions of high ambient temperature.

The chassis and major modules are of cast construction thus ensuring maximum rigidity and effective electrical screening.

Each receiver is supplied with three keys to facilitate removal of the control knobs, a plastic trimming tool and free coaxial terminations for aerial and i.f. connections. Extra sleeves are provided with the terminations for alternative coaxial cable sizes.

### 1.4 TECHNICAL SPECIFICATION

|                        |   |
|------------------------|---|
| <b>Frequency Range</b> | 1–30 Mc/s. Range extends to 0.5 Mc/s with slight degradation of performance.  |
| <b>Stability</b>       | The average receiver, after warm-up time of 1 to 2 hours, will remain tuned to within 50 c/s of the selected frequency under conditions of constant supply voltage and ambient temperature. |
| <b>Input Impedance</b> | 75 $\Omega$ unbalanced.   |
| <b>Tuning</b>          | Effective scale length of approximately 145 feet, i.e. about 6 inches of scale length corresponds to 100 kc/s. Frequency increments remain substantially constant over the entire range.    |
| <b>Calibration</b>     | A 100 kc/s signal derived from a 1 Mc/s crystal oscillator having an accuracy of 5 parts in 10 <sup>6</sup> provides check points at 100 kc/s intervals.                                    |
| <b>Sensitivity</b>     | A1 reception, bandwidth 3 kc/s:<br>1 $\mu$ V for 18dB signal-to-noise ratio.<br>A2 reception, 30% modulated, bandwidth 3 kc/s:<br>3 $\mu$ V for 18dB signal-to-noise ratio.                 |
| <b>Intermodulation</b> | More than 100dB down for interfering signals at least 10% removed from the wanted signal.   |

**Cross Modulation**

For wanted signal levels between  $3\mu\text{V}$  and  $1\text{mV}$ , an interfering signal 10 kc/s removed and modulated 30% must have a level greater than 50dB above that of the wanted signal to produce a cross modulation of 3%. The ratio of wanted to unwanted signal is improved, up to 10% off tune, at the rate of 3dB per cent.

**Blocking**

With similar conditions to those for cross modulation, an unwanted signal  $f_2$  must be 60dB greater before the audio output of the wanted signal  $f_1$  is reduced by 3dB due to blocking.

**Selectivity**

Six alternative i.f. bandwidths are obtained by means of a selector switch. Filter details are:

|    | —6dB      | 100 kc/s I.F. Output | —66dB<br>Detected Output |
|----|-----------|----------------------|--------------------------|
| 1. | 13 kc/s   | 35 kc/s              | 28 kc/s                  |
| 2. | 6.5 kc/s  | 22 kc/s              | 20 kc/s                  |
| 3. | 3.0 kc/s  | 15 kc/s              | 15 kc/s                  |
| 4. | 1.2 kc/s  | 8 kc/s               | 8 kc/s                   |
| 5. | 0.3 kc/s  | Less than 2 kc/s     | Less than 2 kc/s         |
| 6. | 0.10 kc/s | Less than 1.5 kc/s   | Less than 1.5 kc/s       |

Bandwidths 5 and 6 are obtained with crystal-lattice filters; differences in centre frequencies of these bandwidth settings do not exceed 50 c/s.

**I.F. Output**

100 kc/s at  $75\Omega$  impedance. Level 0.2V approx. with a.v.c. in operation. Two outlets in parallel are provided.

**Image and Spurious Responses**

With wideband or tuned input, external image signals are at least 60dB down. Internally generated spurious responses are below noise level in all cases.

**Noise Factor**

Better than 7dB throughout entire range.

**B.F.O. Range**

$\pm 8$  kc/s.

**B.F.O. Stability**

With constant ambient temperature and supply voltage, drift after warm-up time of 1 to 2 hours does not exceed 50 c/s. For input level variations from  $10\mu\text{V}$  to  $1\text{mV}$ , b.f.o. drift is negligible.

**Automatic Volume Control**

A.V.C. is applied to the r.f. and the final i.f. stages. An increase in signal level of 20dB above  $1\mu\text{V}$  improves the signal-to-noise ratio by 18dB. An increase in signal level of 100dB above  $1\mu\text{V}$  increases the a.f. output by less than 7dB.

**A.V.C. Time Constants**

Short: Charge—25 milliseconds.  
Discharge—200 milliseconds.  
Long: Charge—200 milliseconds.  
Discharge—1 second.

**A.F. Response**

With 13 kc/s bandwidth, response remains within  $\pm 4\text{dB}$  from 250 c/s to 6000 c/s.

**A.F. Output**

1.  $2\frac{1}{2}$ -in. loudspeaker (50mW) (1W, North American version) on front panel (switched).
2. Two headphone sockets in parallel on front panel. (See Note).
3. Three independent outputs of 3mW at  $600\Omega$  at rear of chassis.
4. One output of 10mW at  $600\Omega$ . Preset level is independent of A.F. GAIN control setting.
5. One output of 50mW (1W, North American version) at  $3\Omega$ .

**Note:** The two headphone sockets are connected across the loudspeaker on the British version and across one of the  $600\Omega$ , 3mW outlets on the North American version of the receiver.

**Distortion**

Not greater than 5% at 50mW output. (1W, North American version)

**Hum Level**

With A.F. GAIN control at maximum, the hum level is never worse than 40dB below rated output (50mW or 1W respectively).

**Noise Limiter**

A series noise limiter circuit can be switched into operation to provide limiting at modulation levels exceeding 30%.

**Meter Indication**

Alternative switching for indication of signal carrier level or a.f. output level. An 'S' meter is incorporated in the North American version of the receiver.

**Power Supply**

100–125V and 200–250V, 45–65 c/s. Power consumption 100W approx.

**Dimensions**

For rack mounting  
(fitted dust cover)  
Fitted cabinet

| Height           | Width            | Depth                |
|------------------|------------------|----------------------|
| 10 $\frac{1}{2}$ | 19               | 20 $\frac{1}{2}$ in. |
| 26.7             | 48.25            | 51 cm.               |
| 12               | 20 $\frac{1}{2}$ | 21 $\frac{1}{4}$ in. |
| 30.5             | 52               | 55.6 cm.             |

**Weight**

Rack mounted  
In cabinet

67 lb. (30.5 kg).  
97 lb. (44 kg.)

## INSTALLATION

After carefully unpacking the receiver, remove the dust cover and make sure that all valves and screening cans are firmly in place and that no packing material remains within the tuning mechanism.

**2.1 SUPPLY**

Ascertain that the main transformer is set to the appropriate voltage tapping. This is carried out by means of the plug-in links in Standard models and by soldered connections to the transformer in the North American versions. Connect a 3-core power lead (not provided) to the free 3-pin socket supplied and attach this to the input power plug (PL10). On North American versions, a power cable is permanently fitted. Check that the terminals HT.1 and HT.2 situated on the main chassis are linked (unless the L.F. Converter is in use). Note that a form of receiver muting can be obtained by opening this link when the associated transmitter is keyed.

Connect the power lead to the mains supply.

**2.2 FUSES**

Ensure that the rating of the supply fuse and the h.t. fuse is correct viz:

Supply fuse 2A.

H.T. fuse 350mA (North American version 250mA, anti surge).

**2.3 AERIAL**

The impedance at the aerial (antenna) input plug is designed to match into a  $75\Omega$  unbalanced transmission line. The cable termination supplied with the receiver is provided with alternative sleeves to enable it to be used with a type UR.18 or UR.70 cable or similar cables of nominal  $\frac{1}{2}$ -in. or  $\frac{1}{4}$ -in. respectively.

**2.4 AUDIO OUTPUTS**

(a) The two headphone sockets situated on the front panel are connected across the  $3\Omega$  speaker.

*Note:* On the North American receiver, the headphone sockets are connected across one of the  $600\Omega$  3mW. outlets.

(b) The following outputs are connected to the terminal strip situated on the rear of the receiver :—

(i) Three  $600\Omega$  outlets at 3mW.

(ii) One  $3\Omega$  outlet at 50mW (1W, North American version).

(iii) One  $600\Omega$  outlet at 10mW. This output is controlled by a pre-set A.F. LEVEL control on the front panel and is independent of the outputs previously described.

**2.5 100 KC/S LF. OUTPUT**

The connection consists of two coaxial plugs connected in parallel to the 100 kc/s output. The total load should not be less than  $70\Omega$  (e.g. with one outlet loaded by  $75\Omega$ , the other can be used as a high impedance source).

**2.6 AUTOMATIC VOLUME CONTROL**

The a.v.c. line is brought out to the terminal strip on the rear of the chassis for such applications as diversity reception.



## OPERATION

References to the controls are in capitals and are in accordance with the panel titles adjacent to them. Control names on the North American versions are shown in brackets when they differ from the standard titles.

It should be noted that the method of operation of the receiver, which is extremely simple, depends largely upon the purpose for which the receiver is being employed. The instructions given below are concerned with tuning the receiver to a signal of known frequency ; also, notes are included on the use of the various controls.

## 3.1 FUNCTION OF CONTROLS

|                              |  |
|------------------------------|--|
| <b>MAINS (POWER)</b>         | Makes and breaks the power supply to the mains transformer.  |
| <b>AE. (ANT.) RANGE MC/S</b> | This control enables the selection of any one of six aerial ranges plus WIDEBAND position.   |
| <b>AE. (ANT.) ATTENUATOR</b> | This control enables the operator to reduce the level of all incoming signals when strong unwanted signals are present which cannot be rejected sufficiently by tuning the aerial; the input level can also be reduced if the required signal is causing overloading in the early stages of the receiver.  |
| <b>MEGACYCLES</b>            | This scale should be checked periodically to ensure that its setting is reasonably central with respect to the band in use. This is indicated by a reduction of signal or noise on either side of the correct setting.   |
| <b>SYSTEM</b>                | This switch provides facilities for STANDBY, MANUAL, A.V.C., CALIBRATION and CHECK B.F.O.  |
| <b>BANDWIDTH</b>             | The two crystal filters determining the bandwidth are adjusted to ensure that their centre frequencies are all within 50 c/s, thus any bandwidth can be selected without retuning the receiver. Six bandwidths are provided as follows:<br>13 kc/s, 6.5 kc/s, 3 kc/s and 1.2 kc/s (L-C); 300 c/s and 100 c/s (crystal).  |
| <b>A.F. GAIN</b>             | The A.F. Gain control adjusts the audio output.  |
| <b>KILOCYCLES</b>            | The calibration of this scale may be checked at 100 kc/s intervals by setting the system switch to the CAL position.   |
| <b>B.F.O.</b>                | The B.F.O. ON/OFF switch makes or breaks h.t. to the beat frequency oscillator.  |
| <b>B.F.O. NOTE KC/S</b>      | The b.f.o. is exactly tuned to a central point on the i.f. amplifier response when the B.F.O. NOTE KC/S control is set to zero-beat with the calibrator. Having standardized the b.f.o. frequency, the frequency of an incoming signal may be accurately measured by setting the KILOCYCLES control to a zero-beat position; the b.f.o. should be detuned in order to produce an acceptable note for c.w. reception.   |
| <b>AE. (ANT.) TUNE</b>       | If maximum sensitivity is not required, the aerial need not be tuned unless strong unwanted signals are present. It should be noted that the presence of very strong signals anywhere within the spectrum may cause cross-modulation unless the aerial is tuned. Under these conditions, CARE MUST BE TAKEN TO AVOID TUNING THE INPUT TO THE INTERFERING SIGNALS instead of the signal required. Familiarity with the tuning controls will facilitate this.  |
| <b>I.F. GAIN</b>             | The I.F. GAIN control is operative both in the MAN. and the A.V.C. positions of the System switch. In the MAN. position of the System switch, the setting of the control should always be at a minimum consistent with satisfactory a.f. level. The following should be noted when the System switch is in the A.V.C. position. Reducing the i.f. gain results in a reduction of a.v.c. loop gain together with a degraded a.v.c. characteristic. Therefore when in the A.V.C. position, it is desirable that the I.F. GAIN control be set to maximum. A possible exception of this occurs when receiving interrupted signals in which the carrier is periodically switched off; in this case, receiver noise could be troublesome during the quiet intervals. |
| <b>A.V.C.</b>                | The choice of time-constant depends largely on conditions. The LONG time-constant (1 second) should be employed with voice signals; the SHORT time-constant may be used with high speed telegraphy or voice. For hand (low) speed telegraphy, the MAN. position of the System switch should be used (refer to I.F. GAIN).  |

|                   |  |
|-------------------|--|
| <b>A.F. LEVEL</b> | The preset control sets the a.f. level in a separate a.f. stage for feeding a 600Ω 10mW line. It is unaffected by the position of the main A.F. GAIN control. IT IS MOST IMPORTANT that the A.F. LEVEL is not turned towards its maximum position unless the 10mW 600Ω winding is suitably terminated. |
| <b>LIMITER</b>    | When switched into use, the LIMITER reduces the effects of noise peaks exceeding the level of a 30% modulated signal. It does not introduce noticeable distortion below a 30% modulation level.  |
| <b>METER</b>      | With the METER switch in the R.F. LEVEL position, the meter indicates the signal diode current. In the A.F. LEVEL position, the 10mW 600Ω output only is monitored. A calibration mark is provided at 10mW.  |
| <b>SPEAKER</b>    | The loudspeaker may be switched ON or OFF as required. The two telephone jack sockets remain in circuit in either position of the SPEAKER switch.  |

### 3.2 PRELIMINARY SETTING-UP

Switch on the supply by means of the MAINS (POWER) switch. Allow a few minutes for the receiver to warm up.

Set the AE. (ANT.) RANGE MC/S switch to WIDEBAND. Switch the AE. (ANT.) ATTENUATOR to MIN. Set the A.F. GAIN control to its mid-position. Turn the System switch to MAN. Switch the LIMITER and B.F.O. off.

Select a BANDWIDTH of 3 or 6.5 KC/S. Rotate the I.F. GAIN control to three-quarters of fully clockwise.

### 3.3 FILM SCALE CALIBRATION

Set the System switch to CAL. Select a BANDWIDTH of 3 KC/S.

Set the KILOCYCLES scale to that 100 kc/s point which is nearest to the frequency required and adjust the control accurately until a zero-beat note is obtained. Move the milled cursor slide on the dial escutcheon so that the pointer coincides exactly with the selected 100 kc/s division.

Restore all other controls to the preliminary setting shown in Section 3.2 above.

### 3.4 B.F.O. CALIBRATION

Switch on the b.f.o. and set the System switch to CHECK B.F.O.

Adjust the B.F.O. NOTE KC/S control to zero-beat.

Restore all other controls to the preliminary setting shown in Section 3.2 above.

### 3.5 TUNING

Set the MEGACYCLES dial to the required integer. The tuning of this control is quite flat and the optimum position may be found by adjusting the control to the point at which the receiver noise is greatest.

Set the KILOCYCLES scale to the required frequency.

Set the AE. (ANT.) RANGE MC/S switch to the correct frequency band. Adjust the AE. (ANT.) TUNE control for maximum noise.

It should now be possible to identify the desired signal. Switch on the b.f.o. if the required signal is not modulated.

Switch on the b.f.o. and set the calibrated B.F.O. NOTE KC/S control to the zero position, then adjust finally for a zero-beat note.

If it is desired to operate the receiver on c.w., adjust the B.F.O. NOTE KC/S control to the most acceptable audio-beat note. Set the BANDWIDTH control for optimum reception. Set the A.F. GAIN to MAX. (consistent with no over-loading) and adjust the output level with the I.F. GAIN control.

For m.c.w. or r.t. reception, switch the b.f.o. off. Adjust the I.F. and A.F. GAIN controls as for c.w. reception. (Refer to 3.1, I.F. GAIN.)

Set the System switch to A.V.C. and select a SHORT or LONG time-constant as required.

Set the BANDWIDTH control to the optimum position.

### 3.6 "S" METER

The "S" meter in North American versions should be correctly set to zero in order to obtain the maximum accuracy of calibration.

With no antenna connected, set the ANT. ATTENUATOR to MAX. Set the System switch to A.V.C. Turn the I.F. GAIN control to the maximum clockwise position. Note : Unless the I.F. GAIN control is in the maximum position, the "S" meter calibration is upset.

Remove the plated cap below the meter.

Adjust the setting of the balance control (accessible through the hole in the panel) by means of a screwdriver until the meter reads zero.

## SECTION 4

### BRIEF TECHNICAL DESCRIPTION

This section describes briefly, with the aid of the block diagram in Fig. 1, the basic theory of operation. For a more detailed explanation of the receiver, Section 5 (DETAILED CIRCUIT DESCRIPTION) should be consulted.

#### 4.1 SIGNAL INPUT

The aerial loading (75 $\Omega$  unbalanced) is designed for WIDEBAND operation or pre-selected for optimum performance by the six double-tuned aerial coils selected by means of the AE. (ANT.) RANGE MC/S switch.

#### 4.2 FIRST MIXER

Input signals between 0.98 and 30 Mc/s are fed via an r.f. amplifier and a 30 Mc/s low-pass filter to the first mixer (M1) where they are mixed with the output from a variable frequency oscillator VFO-1 (MEGACYCLES tuning). This oscillator has a frequency range of 40.5 to 69.5 Mc/s. The first i.f. stage is in effect a band-pass filter tuned to 40 Mc/s  $\pm$  650 kc/s. Thus, according to the setting of VFO-1, any spectrum of signals 1 Mc/s wide and existing in the range 0.98 to 30 Mc/s can be mixed in M1 to produce an output acceptable to the first i.f. band-pass filter.

It should be noted at this stage that the exact setting of VFO-1 is determined by conditions in the second and fourth mixer circuits ; these restrict the possible settings to positions 1 Mc/s apart (e.g. 40.5, 41.5, 42.5 Mc/s, etc.).

#### 4.3 HARMONIC GENERATOR AND MIXER

The output from a 1 Mc/s crystal oscillator is connected to a harmonic generator. The harmonics derived from this stage are passed through a 32 Mc/s low-pass filter and mixed with the output from VFO-1 in the fourth mixer (M4). This mixer provides an output at 37.5 Mc/s which is amplified before passing through a band-pass filter tuned to 37.5 Mc/s with a bandwidth of  $\pm$  150 kc/s.

The presence of this filter restricts the setting of VFO-1 to an exact number of Mc/s plus 37.5 Mc/s in order to give an output acceptable to the filter and amplifier. As a result, the first v.f.o. must be tuned in 1 Mc/s steps.

#### 4.4 SECOND MIXER

The 40 Mc/s first i.f. signal is mixed in the second mixer (M2) with the 37.5 Mc/s output from M4 in order to produce an output consisting of a 1 Mc/s spectrum in the frequency range 2-3 Mc/s (second i.f.).

To clarify this method of operation, some examples of dial settings and intermediate frequencies corresponding to various incoming signals are tabulated below :—

| Dial<br>Mc/s | Settings<br>kc/s | Signal Freq.<br>$f_s$ Mc/s | VFO-1<br>$f_o$ Mc/s | Xtal Harmonic<br>$nf_c$ Mc/s | 1st I.F.<br>$f_o - f_s$ | Het. Freq.<br>$f_o - nf_c$<br>(M4 output) | 2nd I.F.<br>$nf_c - f_s$ |
|--------------|------------------|----------------------------|---------------------|------------------------------|-------------------------|---|--------------------------|
| 4            | 1,000            | 5.0                        | 44.5                | 7th                          | 39.5                    | 37.5                                      | 2.0                      |
| 5            | 0                | 5.0                        | 45.5                | 8th                          | 40.5                    | 37.5                                      | 3.0                      |
| 18           | 600              | 18.6                       | 58.5                | 21st                         | 39.9                    | 37.5                                      | 2.4                      |

Frequency drift of VFO-1 within the limits of the 37.5 Mc/s filter bandwidth, does not affect the frequency stability of the receiver. A change in this oscillator frequency will alter the first i.f. to the same extent and in the same sense as the nominal 37.5 Mc/s signal from M4. Therefore the difference frequency from M2 will remain constant.

#### 4.5 THIRD MIXER

The 2-3 Mc/s receiver, which follows M2, is preceded by a tuned three stage band-pass filter ganged to the second variable frequency oscillator VFO-2 (KILOCYCLES tuning). This oscillator is temperature compensated and the output is mixed in the third mixer (M3) with the 2-3 Mc/s output from the band-pass filter to provide the third and final intermediate frequency of 100 kc/s.

#### 4.6 THIRD I.F. STAGE

The final i.f. stages are preceded by crystal lattice and L-C filters which provide six alternative bandwidths. Separate signal and a.v.c. diodes are employed and alternative switched time-constants give the optimum conditions for telegraphy and telephony reception. An additional i.f. amplifier is incorporated to give an independent output at 100 kc/s.

#### 4.7 A.F. STAGES

Two independent audio frequency stages are incorporated for either line output or headphone sockets and internal loudspeaker ; each stage is provided with a level control (see TECHNICAL SPECIFICATION).

#### 4.8 CRYSTAL CALIBRATOR

A crystal calibrator unit is incorporated to enable the scale of VFO-2 to be checked at 100 kc/s intervals. These check points are obtained from a regenerative divider controlled by the 1 Mc/s crystal oscillator.

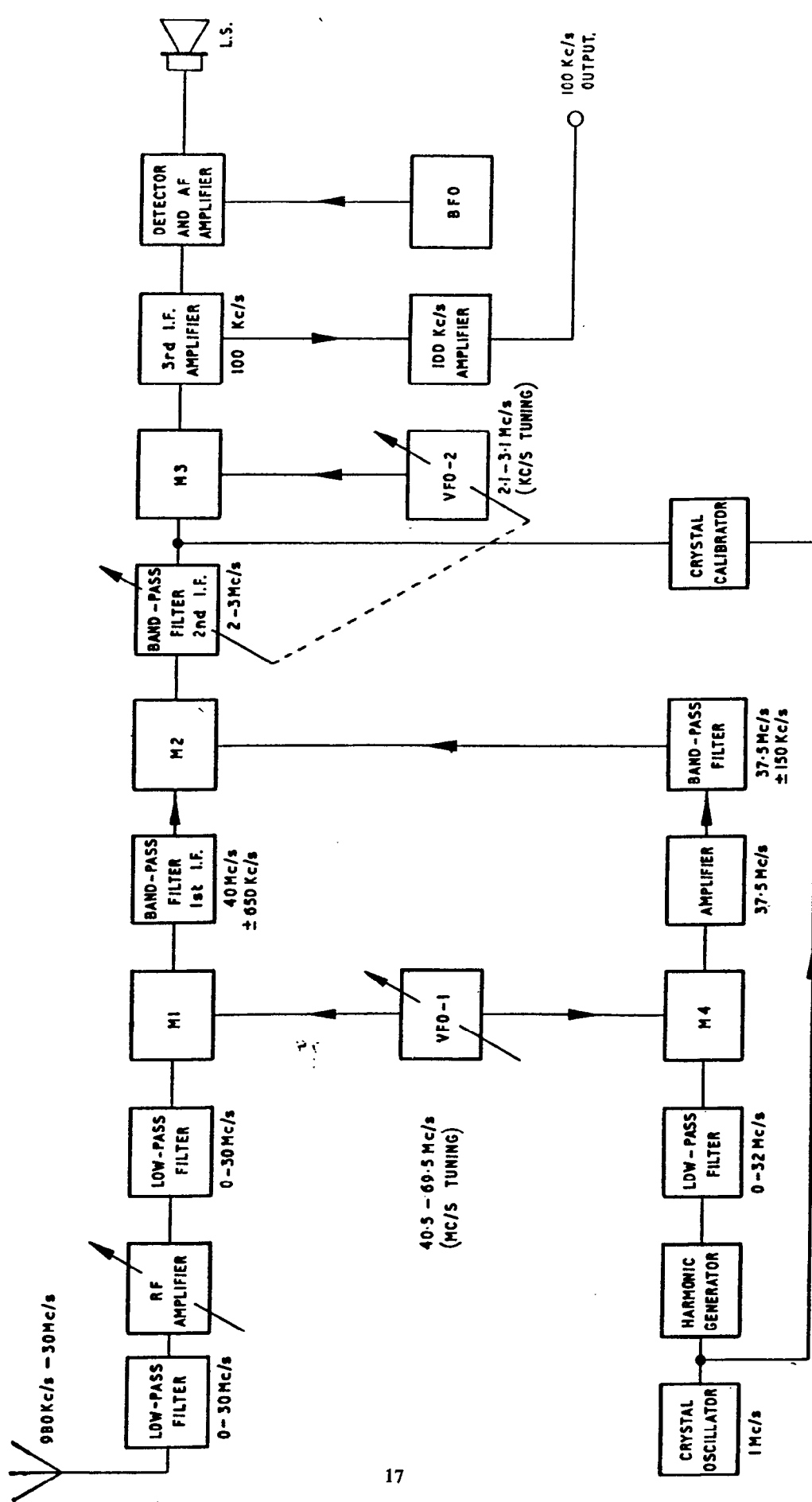


FIG. 1 BLOCK DIAGRAM OF THE RECEIVER TYPE RA.17

## SECTION 5

### DETAILED CIRCUIT DESCRIPTION

Reference should be made to the circuit diagram at the end of this handbook.

#### 5.1 AERIAL CIRCUIT

A 75 $\Omega$  unbalanced aerial source is connected to the tuned r.f. amplifier through a three-section 30 Mc/s low-pass filter and a five-position attenuator covering a range of 0 to 40 dB. Switch S2 selects wideband operation or any one of the six double-tuned aerial coils L4-9 for tuned operation. These aerial coils are aligned by means of dust iron cores. The aerial is tuned by a capacitor C18A/B which is switched out of circuit in the wideband position.

#### 5.2 R.F. AMPLIFIER

The incoming signal is fed via C28 and grid stopper R25 to the grid of V3B; the r.f. stage (V3) employs a variable- $\mu$ , low-noise double-triode; the two halves of the valve are connected in cascade so as to utilize the low-noise high-gain properties of the valve. A delayed a.v.c. voltage, derived from a shunt diode network, is applied to the grid of V3B when the signal level is approximately 10 $\mu$ V. The capacitors C40 and C41 ensure that the cathode is adequately decoupled over the wide frequency range. Ferrite beads have been fitted to the heater lead, connected to pin 4, the anode of V3A and the cathode of V3B adjacent to C41, to prevent parasitic oscillations occurring.

#### 5.3 30 Mc/s LOW-PASS FILTER

The amplified signal is passed to a 30 Mc/s low-pass filter which has a substantially flat response over the frequency range. L27, C47 and R28 constitute the first 'L half-section' of the filter. The signal is then fed at low impedance (680 $\Omega$ ) through the coupling capacitor C74 and the grid stopper R45 to the control grid of V7, the first mixer stage. The input capacitance of V7 forms the capacitance to chassis between L15 and L17 required to complete the filter network.

**Note :** This capacitance is not critical, therefore no adjustment will be necessary should V7 be changed.

#### 5.4 FIRST VARIABLE FREQUENCY OSCILLATOR (VFO-1)

This circuit comprises a cathode-coupled Hartley oscillator stage (V5) which may be continuously tuned over the frequency range of 40.5-69.5 Mc/s. The frequency determining components are an inductance L36 and a variable capacitance C76. Alignment is accomplished by adjusting the aluminium core of L36 and the trimming capacitor C77. The variable capacitor C76 is coupled to the Mc/s dial which is calibrated from 0 to 29 Mc/s. The anode load consists of L20, a compensating inductance which is wound on a 470 $\Omega$  resistor R18. The oscillator is coupled via C85 to the signal grid of the first mixer stage V7 and also via C42 to the control grid of the harmonic mixer V4.

**Note :** The Mc/s dial calibration may be affected if V5 is changed. The necessary correction may be made by adjusting C77 with the Mc/s dial set to 29 Mc/s. (See Part 2, Section 5, para. 5.9).

#### 5.5 FIRST MIXER (M1)

The outputs from the 30 Mc/s low-pass filter and the variable frequency oscillator VFO-1 are fed to the signal grid of the mixer stage (V7) which produces a signal at 40 Mc/s. The signal is then passed to a 40 Mc/s band-pass filter which forms the anode load of this stage.

#### 5.6 40 Mc/s BAND-PASS FILTER

The 40 Mc/s band-pass filter consists of eight over-coupled tuned circuits connected in cascade and is tuned by the trimming capacitors C21, C33, C43, C53, C61, C70, C79 and C88. This filter, which has a passband of 40 Mc/s  $\pm$  650 kc/s, ensures that only the required 1 Mc/s spectrum of signals is passed to the second mixer stage. This filter is deliberately set to a slightly wider passband than is theoretically required, to allow for possible drift in VFO-1.

#### 5.7 1 Mc/s CRYSTAL OSCILLATOR

The frequency of the crystal oscillator V1, which is a cathode-coupled Colpitts circuit, may be set precisely to 1 Mc/s by adjusting the trimming capacitor C2. The anode coil L2 which is adjusted to resonate at 1 Mc/s by means of a dust iron core is electron coupled to the oscillator. The fixed capacitors C9, C10 and C11 complete the tuned circuit. The output from V1 is capacitance-coupled to the harmonic generator V2, coaxial plug PL3A for feeding a 1 Mc/s input into the i.f. converter, and also to the first grid of the mixer valve V13 via PL2/SK2.

## 5.8 HARMONIC GENERATOR

The 1 Mc/s signal is fed through the coupling capacitor C8 to the control grid of the harmonic generator (V2). Megacycle harmonics are produced in this stage by operating the valve in a non-linear state. A suitable bias potential is produced due to the time constant of C8 and R13. The screen grid is not de-coupled.

## 5.9 32 Mc/s LOW-PASS FILTER

The megacycle harmonics are fed through a 32 Mc/s low-pass filter circuit to prevent harmonics other than those required from passing to the harmonic mixer (V4). Limited control over the cut-off frequency is provided by C7 which is adjusted to equalize the output from the filter at the harmonic frequencies corresponding to 28 and 29 Mc/s on the MEGACYCLE dial.

## 5.10 HARMONIC MIXER (M4)

The outputs from the 32 Mc/s low-pass filter and VFO-1 are mixed in the harmonic mixer (M4) by applying the filtered megacycle harmonics to the suppressor grid and the output from the VFO-1 to the control grid. The 37.5 Mc/s output is selected by the tuned anode load, consisting of a fixed capacitor C50 and an inductance L28, which may be adjusted by means of a dust iron core, and coupled by C51 to V6. R36 is a grid stopper.

## 5.11 2-STAGE 37.5 Mc/s AMPLIFIER (1)

The anode load of V6 is a tuned circuit consisting of a fixed capacitor C67 and an inductor L33 which is tuned to 37.5 Mc/s. Frequency adjustment is by the dust iron core in L33. This stage feeds the amplified signal via C68 to the following stage V8. The 37.5 Mc/s signal is then passed to the 37.5 Mc/s band-pass filter. The anode load of this stage is provided by this filter.

## 5.12 37.5 Mc/s BAND-PASS FILTER

The 37.5 Mc/s band-pass filter consists of eight under-coupled tuned circuits arranged in cascade. These filter sections may be tuned by C24, C35, C45, C55, C63, C72, C81 and C90 respectively. This filter, which has a passband of 300 kc/s, allows for possible drift in VFO-1. The narrow passband and high rejection to frequencies outside the passband prevent spurious signals from reaching the second mixer stage (V9).

## 5.13 37.5 Mc/s AMPLIFIER (2)

The filtered 37.5 Mc/s signal is further amplified by V10 before being passed to the second mixer stage (V9). To prevent interaction between the 40 Mc/s band-pass filter and the 37.5 Mc/s tuned circuit (L50 and C113) and to enable either circuit to be adjusted without affecting the other, a balancing circuit is included which is shown in a simplified form in figure 2.

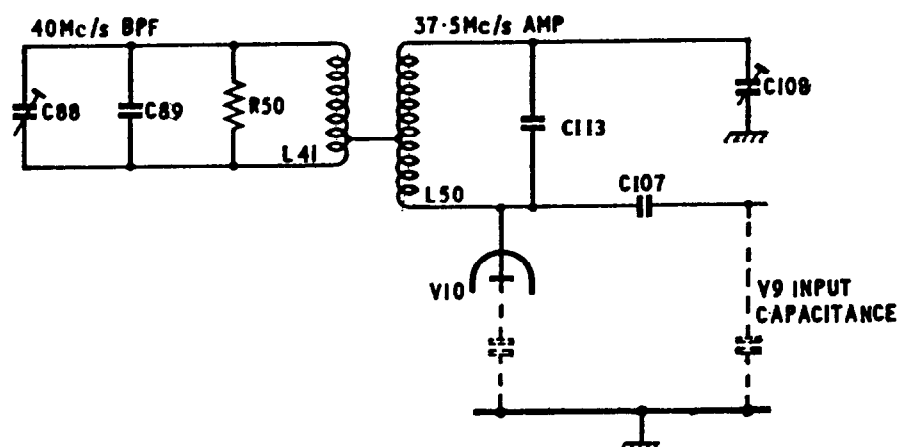


FIGURE 2

The 40 Mc/s signal is introduced into the 37.5 Mc/s tuned circuit at a point of zero r.f. potential since L50 is centre tapped and C108 is adjusted to be equal to the total of the capacitances of V10 anode to ground, C107 and the input capacitance of V9.

**Notes :** The anode load of V10 is adjusted to 37.5 Mc/s by adjusting the dust iron core in L50.  
The balancing circuit will not be affected if V9 or V10 is changed.

## 5.14 SECOND MIXER (M2)

This mixer (V9) produces the second intermediate frequency of 2–3 Mc/s by mixing the 40 Mc/s i.f. and the 37·5 Mc/s signal. The anode choke L51 and the tuned circuit formed by C116 and L52 remove the 37·5 Mc/s frequency and other h.f. components, so that only the second i.f. is passed to the 2–3 Mc/s band-pass filter preceding the third mixer stage. The series tuned circuit is tuned to 37·5 Mc/s by adjusting the dust iron core in L52.

## 5.15 2–3 Mc/s TUNED BAND-PASS FILTER

This filter (which is ganged to the second Variable Frequency Oscillator) consists of three tuned band-pass filter sections as follows :—

- (a) An inductor L59 and a variable capacitor C129. A fixed capacitor C127 and a trimmer C128 complete this section. L59 is tapped to provide an input connection via the coaxial plug PL5 so that the 2–3 Mc/s low impedance output of the L.F. Converter may be connected.
- (b) A variable inductor L58 is connected in series with a coupling coil L60 and a variable capacitor C126. A fixed capacitor C124 and a trimmer C125 are connected in parallel with C126.
- (c) An inductor L57 and a variable capacitor C123 in parallel with a fixed capacitor C121 and a trimmer C122 form the final section.

The correct bandwidth is obtained by adjusting the dust iron cores and the trimming capacitors C128, C125 and C122 respectively.

## 5.16 THIRD MIXER

The output from the 2–3 Mc/s band-pass filter is directly coupled to the signal grid of a pentagrid valve V11 and the second VFO output (2·1 to 3·1 Mc/s) is fed through the coupling capacitor C143 to the oscillator grid. The resistor R68 completes the d.c. path from this grid to earth. The 100 kc/s output obtained from this mixer stage is then fed via PL6, SK6 and a screened cable to the crystal filter unit.

**Note :** The resistors R67 and R72 are grid stoppers.

## 5.17 SECOND VARIABLE FREQUENCY OSCILLATOR (VFO-2)

The second Variable Frequency Oscillator, covering a frequency range of 2·1 to 3·1 Mc/s, is an electron coupled Hartley circuit. The oscillation frequency is determined by an inductance L55 (which can be adjusted by means of a ferrite core), a fixed capacitor C137, a trimming capacitor C136 and a variable capacitor C139 which is ganged to the tuned band-pass filter. The KILOCYCLES scale which is calibrated between 0 and 1,000 kc/s is coupled to this ganged capacitor. The output from VFO-2 is resistance-capacitance coupled (R76 C143) to the third mixer stage (V11). An additional output from the cathode of VFO-2, is fed directly to a coaxial plug PL11 for feeding auxiliary units.

## 5.18 CRYSTAL FILTER

Six alternative switched i.f. bandwidths are available as follows:—

$$\left. \begin{array}{l} 100 \text{ c/s} \\ 300 \text{ c/s} \end{array} \right\} \text{Crystal} \qquad \left. \begin{array}{l} 1\cdot2 \text{ kc/s} \\ 3\cdot0 \text{ kc/s} \\ 6\cdot5 \text{ kc/s} \\ 13\cdot0 \text{ kc/s} \end{array} \right\} \text{L-C}$$

In the crystal positions the third mixer anode is connected to L48 in the crystal filter. L47 and L49 provide a balanced output which is tuned by capacitors C109 and C110. In the 100 c/s position, the balanced output is connected via crystals XL2 and XL5 to the first tuned section of the 100 kc/s L-C filter. The differential trimmer C118 is the phasing control for this bandwidth. XL3, XL6 and capacitor C119 form a similar circuit for the 300 c/s position. Damping resistors R64 and R65 are connected across the tuned circuits to obtain the required bandwidth.

In the four L-C bandwidth positions the crystal filter is by-passed and the anode of the third mixer valve (V11) is connected directly to the first tuned section of the 100 kc/s L-C filter.

## 5.19 100 kc/s L-C FILTER

### (i) L-C Bandwidths

This filter consists of four tuned circuits arranged in cascade. In the L-C bandwidth positions, the signal is fed to the tuned circuit formed by L61 and the combination of the capacitors C145, C146, C146A and C147. The second section consists of L62 and L63 in series with C152, C152A and C153. The final section consisting of L68 and L71 in series with C161 and C162, is damped by the series resistors R86, R87, R87A and R88 according to the bandwidth. In the L-C positions the output is taken from a capacitive divider formed by C161 and C161A with C170, to equalize the gains in the L-C and crystal bandwidth positions.

The L-C bandwidths are obtained by varying the degree of coupling between each section of the filter in addition to the damping resistors in the final stage. The capacitor C175 is included to compensate for the effective reduction of the input capacitance of V14, appearing across the tuned circuit, when switching from crystal to L-C positions.

## (ii) Crystal Bandwidths

To maintain the input capacitance of the L-C filter, in the crystal positions, a trimming capacitor C148 is switched into circuit. This trimmer is adjusted to be equal to the output capacitance of V11 and the screened cable.

In the crystal bandwidth positions, the L-C filter is operating in its narrow bandwidth position, i.e. 1.2 kc/s.

**Note :** The damping resistors R77 and R80 are disconnected except during filter alignment.

## 5.20 FIRST 100 kc/s I.F. AMPLIFIER

The output from the L-C filter is passed through a coupling capacitor C164 to the control grid of the pentode amplifier valve V14. This grid is returned via R96 to the a.v.c. line which is filtered at this point by R102 and C173. The screen potential is derived from a potential divider formed by R93, R94 and R97. This stage is coupled to the second i.f. amplifier and the i.f. output stage by a double tuned transformer having an over-coupled characteristic.

## 5.21 SECOND 100 kc/s LF. AMPLIFIER

The signal from the first i.f. transformer is fed through the grid stopper R114 to the control grid of the second i.f. amplifier. H.T. is supplied to the screen via the dropping resistor R113 and is de-coupled by C181. The anode load is a tuned circuit consisting of L77, C192 and C191. This circuit is heavily damped by R112. The secondary winding L78 and L79 is tuned by C195A and C195B with R120A as a damping resistor. The output is fed to the diode detector anode.

## 5.22 DIODE DETECTOR

The low potential end of L79 is connected through the r.f. filter (C209, R128, C210, R129 and C211) to the diode load R130. With the meter switched to R.F. LEVEL the meter indicates the detector diode current. The resistor R131 is included to complete the diode detector circuit when the meter is switched out of circuit.

## 5.23 NOISE LIMITER

The noise limiter diode (pins 2 and 5 of V21) is connected in a series circuit to operate at approximately 30% modulation. Its operation is explained with reference to Figure 3.

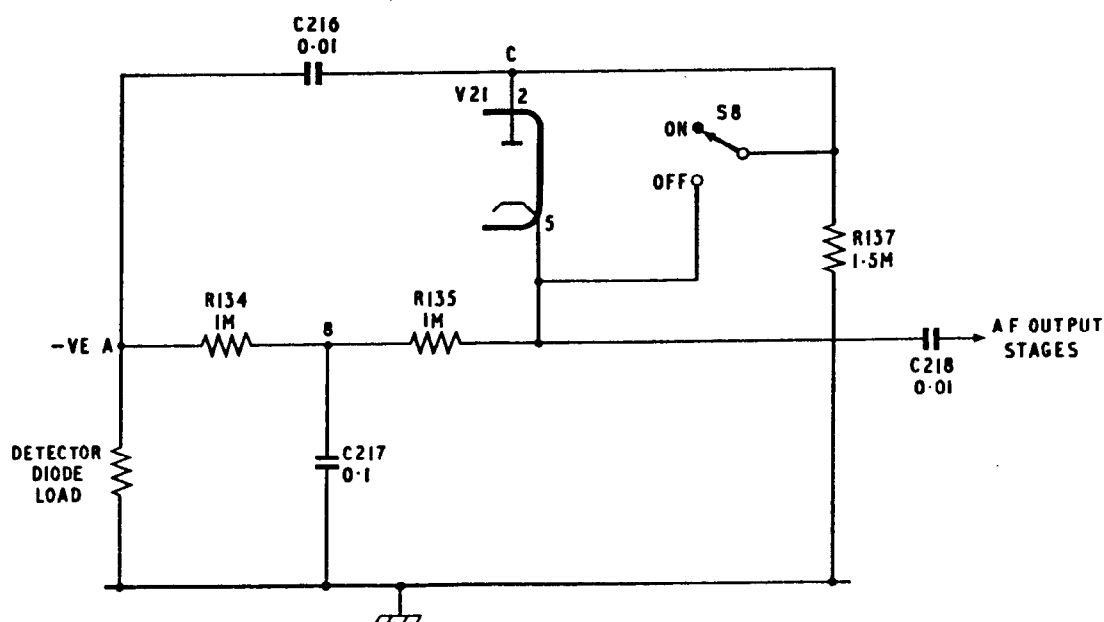


FIGURE 3



The d.c. path from point A is through R134, R135, the diode and R137. The a.f. signal path from the detector diode load is through C216, the diode and C218 when S8 is open. In the presence of a signal, a negative potential varying with the depth of modulation, will be developed at point A thus causing the diode to conduct. The negative potential at B, will be lower than that at A and will be maintained at a constant level due to the long time constant of R134 and C217. R135 allows the cathode potential to vary in sympathy with the modulation provided the modulation depth does not exceed 30%. The potential appearing at the cathode of the noise limiter diode therefore consists of a steady negative potential with the modulation superimposed. When noise impulses corresponding to high modulation peaks appear at point A and via C216 at point C, the voltage across the diode changes sign thereby causing the diode to stop conducting and open-circuit the a.f. signal path. With S8 in the OFF position the limiter is inoperative.

#### 5.24 A.V.C. AND T.C. DIODE

The signal appearing at the anode of V16 is passed through the capacitor C193 to the anode of the a.v.c. diode. The diode load is formed by R116. A positive potential derived from R120, R121 and R122, supplies the required a.v.c. delay voltage to the cathode of this diode. When the A.V.C. switch is in the SHORT position and the System switch set to a position in which the a.v.c. is operative, i.e. A.V.C., CAL or CHECK B.F.O., the anode of the a.v.c. diode is connected to the a.v.c. line via L81 and R127. The choke L81 is tuned by C203 to a frequency slightly below 100 kc/s so that it presents a small capacitance at 100 kc/s, thus R127 is prevented from shunting the diode load. When the A.V.C. switch is in the LONG position the a.v.c. de-coupling capacitors C182 and C173 are charged through R127 and the Time Constant diode. When the signal level falls, the capacitors C182 and C173 discharge through R118, R127 and L81 into the diode load resistor R116. The a.v.c. potential is brought out via R123 to the tag strip at the rear of the receiver for external use if required. With the System switch set to the MANUAL position, the a.v.c. line is connected to the I.F. GAIN control RV1, thus the gain of the 100 kc/s amplifiers may be varied by adjusting the negative potential applied to the a.v.c. line.

#### 5.25 AUDIO OUTPUT

Audio frequencies are applied to the control grid of V22 (V23B, North American version) via RV2 the R.F. GAIN control. The output transformer (T2) provides four separate outputs as follows: 50mW (1W, North American version) into 3 $\Omega$ , and three windings supplying 3mW into 600 $\Omega$ .

The headphone jacks JK1 and JK2 and the internal loudspeaker (which may be switched out of circuit by operating S11) are connected across the 3 $\Omega$  winding.

#### 5.26 A.F. LINE OUTPUT

The audio frequencies are also applied to the grid of V23 (V23A, North American version) via RV3, the A.F. LEVEL control; this control presets the level from the output transformer T3. The transformer provides a 10mW output at 600 $\Omega$  which is suitable for direct connection to landlines. A bridge rectifier MR1 is connected across the output via R142 and R143. The meter may be switched across the rectifier circuit so that the operator can monitor the a.f. output.

**Note :** The red line on the meter scale corresponds to 10mW output into 600 $\Omega$ .

#### 5.27 BEAT FREQUENCY OSCILLATOR

The beat frequency oscillator (V19) employs an electron-coupled Hartley circuit. The oscillation frequency is determined by a fixed inductor L82 and a variable capacitor C200 in parallel with C202 and C201. The trimming capacitor C201 is adjusted to produce an output frequency of precisely 100 kc/s when the beat frequency oscillator frequency control is set to zero. Bias is applied to this valve by C199 and R125.

The b.f.o. output is coupled to the diode detector anode via C215. The b.f.o. is supplied with h.t. via S7 except when the System switch is in the CAL or STANDBY positions.

#### 5.28 100 kc/s I.F. OUTPUT

The control grid of V17 is connected to the secondary of the first 100 kc/s i.f. transformer which feeds the stage with the 100 kc/s signal. The screen resistor R108 and the cathode bias resistor R115 are of the same values as used in the second 100 kc/s i.f. amplifier, hence the a.v.c. characteristic of this stage is identical to that of the main receiver. The anode load resistor R109 feeds the auto transformer L76 via the blocking capacitor C189. This transformer provides a 70 $\Omega$  output at PL8 and PL9 for external applications.

**Note :** PL8 and PL9 are connected in parallel, therefore only one 100 kc/s output is available at 75 $\Omega$ , and to avoid a mis-match the other connection should be made at high impedance.

## 5.29 CRYSTAL CALIBRATOR

The crystal calibrator, controlled by the 1 Mc/s crystal, feeds signals at 100 kc/s intervals to the signal grid of the third mixer stage to provide calibration check points.

The 1 Mc/s signal, fed through PL2, is connected through SK2 and the grid stopper R83 to the first grid of the mixer valve V13. The anode load consists of a 100 kc/s tuned circuit (L70 C167) and is coupled to the control grid of V15 through the capacitor C168. The anode load of V15 (L75 C177) is tuned to 900 kc/s and is coupled via C178 to the third grid of V13. V15 is heavily biased so that it functions as a frequency multiplier.

An output of 900 kc/s, appearing across the tuned circuit (L75 C177) is coupled to grid 3 of V13 thereby producing a difference frequency of 100 kc/s relative to the 1 Mc/s input. The 100 kc/s output appears across the anode tuned circuit (L70 C167) and is fed to the control grid of V15. The ninth harmonic is selected in turn by the anode tuned circuit (L75 C177) of V15 and fed back to the third grid of V13 to provide the beat frequency of 100 kc/s with the 1 Mc/s input. This crystal-controlled regenerative circuit is thus self-maintaining. The 100 kc/s output is obtained from the coil L69 which is mutually coupled to L70 and fed via the octal plug (PL7) to the third mixer V11.

## 5.30 POWER SUPPLIES

The conventional bi-phase half-wave rectifier circuit, employing a capacitor input filter, provides 220 volts h.t. supply. A 165 $\Omega$  resistor R124 is connected between the negative line of the power supply and earth thus providing a negative 25V d.c. supply for gain control purposes. The resistor R136 has been included to limit the peak current of V20 to a safe value. To remove mains-borne interference the capacitors C224 and C225 are included. All valve heaters and the scale illuminating lamp are supplied from the 6.3V 7A winding. The mains transformer T1 has input taps at 0, -5, -10, 110, 125, 210, 230 and 250 volts and is connected to the supply via F1 (2A), S10 and a three-pin Mk. IV plug and socket (PL10, SK10); this does not apply to North American versions of the receiver.

## 5.31 SYSTEM SWITCH

The following conditions exist for each setting of the System switch. The link on the h.t. adaptor terminals is assumed to be in position.

- (a) **STANDBY** S5A disconnects the h.t. from all stages and connects R119A across the h.t. as a compensating load.
- (b) **MANUAL**
  - (i) The h.t. is passed through S5A, S5B and S5C to all stages except the calibrator unit.
  - (ii) S5F connects h.t. to the b.f.o. when S7 is switched on.
  - (iii) The a.v.c. line is disconnected from the a.v.c. diode by S5D and connected to the I.F. GAIN control (RV1) by S5E.
- (c) **A.V.C.**
  - (i) (b) (i) and (b) (ii) applicable.
  - (ii) S5E renders the I.F. GAIN control inoperative.
  - (iii) S5D connects the a.v.c. line to the a.v.c. diode.
- (d) **CAL.**
  - (i) H.T. is applied via S5A, S5B and S5F to all stages except :—
    - The r.f. amplifier (V3)
    - The first v.f.o. (V5)
    - The first mixer (V7)
    - The second mixer (V9)
    - The final 37.5 Mc/s amplifier (V10)
    - The b.f.o.
  - (ii) (c) (ii) and (c) (iii) applicable.
- (e) **CHECK BFO**
  - (i) (d) (i) applicable except that h.t. is also applied to the b.f.o.
  - (ii) (c) (ii) and (c) (iii) applicable.

## 5.32 "S" METER

Suitable circuitry is included in North American versions only of the receiver. The meter is connected between the cathode of V16 and a point of preset (RV4) positive potential. It is calibrated to provide a reading of "S1" for a 1.25 $\mu$ V signal and ascending "S" points in approximately 4dB steps. Above "S9", divisions are in increments of 10dB. It should be remembered that only with the I.F. GAIN control at maximum is the correct calibration maintained.

## **PART 2**

### **MAINTENANCE**

# PART 2

## MAINTENANCE

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## **WARNING**

The Receiver will, under normal conditions, remain in alignment over an extremely long period of time, consequently ALL POSSIBILITY OF OTHER CAUSES OF LOW SENSITIVITY SHOULD BE ELIMINATED BEFORE RE-ALIGNMENT IS CONSIDERED, and should then only be undertaken by order of the Engineer responsible for the maintenance of the equipment.

Should it become necessary to re-align any part of the receiver only a very small angular adjustment of the trimmers should be necessary unless units have been changed.

## TEST EQUIPMENT REQUIRED FOR MAINTENANCE

The following items of test gear are required to carry out the maintenance described in this part of the handbook :—

- (a) Valve voltmeter reading up to 5·0V at frequencies up to 70 Mc/s
- (b) Signal generator capable of operating on fundamental frequencies up to 40 Mc/s
- (c) Digital frequency meter measuring frequencies at least up to 100 kc/s
- (d) Multi-meter measuring a.c. and d.c. quantities up to 500V with resistance of 20,000 $\Omega$  per volt
- (e) Heterodyne wavemeter measuring 40–70 Mc/s
- (f) Miscellaneous: viz. 0·1 $\mu$ F capacitor, 4·7k $\Omega$  resistor and 12pF trimmer capacitor.

**Note :** Major users of the RA.17 Receiver are advised to obtain factory-type test jigs for alignment of the various units. Details of these jigs and specially designed test gear will be supplied on request. A supplement to Section 5 (Alignment Procedures) describing the employment of this test gear can be made available to such users.

# SECTION 1

## SPURIOUS RESPONSES

### 1.1 ORIGINS OF SPURIOUS RESPONSES

In a highly sensitive receiver, precautions against internally generated spurious responses are essential. To this end, the various sections of the receiver have been carefully screened and the power supplies filtered.

Any reduction in the screening efficiency or the failure of any filtering component may result in spurious signals being generated. It is therefore essential to ensure that the bonding surfaces are clean and that all securing screws are tight. Spurious responses in the receiver may occur from the following main causes:—

- (a) 37.5 Mc/s break-through from the second mixer V9 to the third mixer V11
- (b) Break-through of 1 Mc/s harmonics
- (c) Break-through of b.f.o. harmonics
- (d) Responses at 2.550 and 3.050 Mc/s due to second v.f.o. break-through.

### 1.2 CHECKS FOR SPURIOUS RESPONSES

Spurious responses are measured relative to receiver noise in the following manner:—

When a response is located, the receiver is de-tuned from it just sufficiently to render the beat note inaudible. The i.f. gain is then adjusted to provide a convenient noise reference output (1mW) and the receiver re-tuned to the spurious signal for maximum output. The dB rise in audio output is a measure of the spurious signal level relative to receiver noise.

Standard conditions of test :

- No connection to aerial socket
- System switch to MAN
- I.F. GAIN at MAX
- B.F.O. on
- 3 kc/s bandwidth
- AE (ANT.) ATTENUATOR at MIN.

- (a) **37.5 Mc/s Break-through to Third Mixer**  
Switch AE (ANT.) RANGE to WIDEBAND.

This response will be indicated as a beat note which varies rapidly in frequency with respect to the KILOCYCLES scale, i.e. a change of 1 kc/s on the scale results in a much larger change in the note. It will also move along the KILOCYCLES scale if the MEGACYCLES dial is adjusted slightly. This response may be eliminated by adjusting the 37.5 Mc/s trap (L52 at second mixer anode).

- (b) **1 Mc/s Harmonic Break-through**  
Switch AE (ANT.) RANGE to WIDEBAND.

1 Mc/s break-through responses appear at 0 and 1,000 on the KILOCYCLES scale at each setting of the MEGACYCLES dial and are generally more prominent with wideband input. If the response is dependent upon the setting of the MEGACYCLES dial, the 1 Mc/s spectrum is probably breaking through to the first mixer stage. If the response is independent of the MEGACYCLES dial setting, it is due either to break-through of the second and/or third harmonic to the second or third mixer stage. Remove second mixer valve to eliminate this stage and so determine in which stage the break-through occurs.

- (c) **First V.F.O. Harmonics**

Spurious responses may occur at 4.5, 5.5 and/or 17.5 Mc/s, if C42A and/or C194A are open-circuit. These responses are caused by the harmonics of the first v.f.o. breaking through to the second mixer stage and beating with the harmonics of the 37.5 Mc/s heterodyne voltage.

- (d) **B.F.O. Harmonics**

These responses may be detected at 100 kc/s intervals between 1 and 1.5 Mc/s when the b.f.o. frequency is 100 kc/s and the receiver aerial input is tuned.

- (e) **Second V.F.O. Break-through**

Responses may occur at 2.550 and 3.050 Mc/s with tuned aerial input.

Ascertain that the first and second v.f.o. are not in contact, that the v.f.o. chassis is well bonded to the main chassis and the fixing screws are tight.

**Notes:** A failure in any one of the following capacitors C66, C92, C96, C97, C98, C103 or C104 may result in increased 'end of band' responses. These responses will disappear when the MEGACYCLE dial is de-tuned.

The failure of C117, C154, C155, C207, C208 or C214 can result in increased 'end of band' responses, or b.f.o. harmonic break-through. De-tuning the MEGACYCLES dial will have no effect.

## SECTION 2

### VALVE DATA

Details of valves used in the British and American receiver are shown below. A key to the valve base connections is provided in Figure 4. The location of valves in the receiver is shown in Figure 5.

#### 2.1 VALVE CONNECTIONS (British Version)

| Pin No. | CV138           | CV140     | CV1377     | CV4012           | CV454   | CV2209         | CV3998          | CV5331    |
|---------|-----------------|-----------|------------|------------------|---------|----------------|-----------------|-----------|
|         | EF91            | EB91      | GZ34       | EK90             | EF93    | 6F33           | E180F           | ECC189    |
| 1       | Grid 1          | Cathode 1 | N.C.       | Grid 1           | Grid 1  | Grid 1         | Cathode         | Anode 2   |
| 2       | Cathode         | Anode 2   | Heater     | Cathode & Grid 5 | Grid 3  | Cathode        | Grid 1          | Grid 2    |
| 3       | Heater          | Heater    | Omitted    | Heater           | Heater  | Heater         | Cathode         | Cathode 2 |
| 4       | Heater          | Heater    | Anode      | Heater           | Heater  | Heater         | Heater          | Heater    |
| 5       | Anode           | Cathode 2 | Omitted    | Anode            | Anode   | Anode          | Heater          | Heater    |
| 6       | Grid 3 & Screen | Screen    | Anode      | Grid 2 & Grid 4  | Grid 2  | Grid 3 & Diode | I.C.            | Anode 1   |
| 7       | Grid 2          | Anode 1   | Omitted    | Grid 3           | Cathode | Grid 2         | Anode           | Grid 1    |
| 8       | —               | —         | Heater     | —                | —       | —              | Grid 3 & Screen | Cathode 1 |
| 9       | —               | —         | —          | —                | —       | —              | Grid 2          | Screen    |
| Base    | B7G             | B7G       | Int. Octal | B7G              | B7G     | B7G            | B9A             | B9A       |

#### 2.2 VALVE COMPLEMENT AND TYPICAL D.C. VOLTAGES (British Version)

| Cct. Ref. | Function                   | CV No. | Equivalent | Anode          | Screen  | Cathode  | Cct. Ref. |
|-----------|----------------------------|--------|------------|----------------|---------|----------|-----------|
| V1        | Crystal Oscillator         | 138    | EF91       | 175 (5)        | 175 (7) | 40 (2)   | V1        |
| V2        | Harmonic Generator         | 138    | EF91       | 195 (5)        | 70 (7)  | —        | V2        |
| V3        | R.F. Amplifier             | 5331   | ECC189     | 185 (1)        | —       | 1.0 (8)  | V3        |
|           |                            |        |            | 95 (2) Grid    |         |          |           |
|           |                            |        |            | 95 (6)         |         |          |           |
| V4        | Harmonic Mixer             | 2209   | 6F33       | 200 (5)        | 150 (7) | 1.95 (2) | V4        |
| V5        | First V.F.O.               | 138    | EF91       | 210 (5)        | 200 (7) | —        | V5        |
| V6        | 37.5 Mc/s Amplifier        | 138    | EF91       | 205 (5)        | 150 (7) | 1.15 (2) | V6        |
| V7        | First Mixer                | 3998   | E180F      | 190 (7)        | 140 (9) | 0.95 (1) | V7        |
| V8        | 37.5 Mc/s Amplifier        | 138    | EF91       | 200 (5)        | 185 (7) | 1.8 (2)  | V8        |
| V9        | Second Mixer               | 3998   | E180F      | 200 (7)        | 155 (9) | 1.1 (1)  | V9        |
| V10       | 37.5 Mc/s Amplifier        | 138    | EF91       | 205 (5)        | 200 (7) | 1.85 (2) | V10       |
| V11       | Third Mixer                | 4012   | EK90       | 210 (5)        | 85 (6)  | 1.18 (2) | V11       |
| V12       | Second V.F.O.              | 138    | EF91       | 175 (5)        | 115 (7) | —        | V12       |
| V13       | Calibrator                 | 4012   | EK90       | 250 (5)        | 90 (6)  | 2.0 (2)  | V13       |
| V14       | First I.F. Amplifier       | 454    | EF93       | 190 (5)        | 65 (6)  | 0.8 (7)  | V14       |
| V15       | Calibrator                 | 454    | EF93       | 230 (5)        | 130 (6) | 6.0 (7)  | V15       |
| V16       | Second I.F. Amplifier      | 454    | EF93       | 200 (5)        | 95 (6)  | 1.45 (7) | V16       |
| V17       | I.F. Output                | 454    | EF93       | 170 (5)        | 105 (6) | 1.35 (7) | V17       |
| V18       | A.V.C. and T.C.            | 140    | EB91       | —              | —       | 28.0 (1) | V18       |
| V19       | B.F.O.                     | 138    | EF91       | 180 (5)        | 220 (7) | —        | V19       |
| V20       | Power Rectifier            | 1377   | GZ34       | 250 r.m.s. (6) | —       | 250 (8)  | V20       |
|           |                            |        |            | 250 r.m.s. (4) |         |          |           |
| V21       | Detector and Noise Limiter | 140    | EB91       | —              | —       | —        | V21       |
| V22       | Audio Output               | 138    | EF91       | 210 (5)        | 220 (7) | 2.1 (2)  | V22       |
| V23       | A.F. Output                | 138    | EF91       | 210 (5)        | 220 (7) | 2.1 (2)  | V23       |
| V24       |                            | 469    | EA76       | —              | —       | —        | V24       |



### 2.3 VALVE CONNECTIONS (North American Version)

| Pin No. | 6AU6            | 6SE8      | 6688            | 6AS6    | 6BE6             | 6BA6            | 6AL5      |
|---------|-----------------|-----------|-----------------|---------|------------------|-----------------|-----------|
| 1       | Grid 1          | Anode 2   | Cathode         | Grid 1  | Grid 1           | Grid 1          | Cathode 1 |
| 2       | Grid 3 & Screen | Grid 2    | Grid 1          | Cathode | Cathode & Grid 5 | Grid 3 & Screen | Anode 2   |
| 3       | Heater          | Cathode 2 | Cathode         | Heater  | Heater           | Heater          | Heater    |
| 4       | Heater          | Heater    | Heater          | Heater  | Heater           | Heater          | Heater    |
| 5       | Anode           | Heater    | Heater          | Anode   | Anode            | Anode           | Cathode 2 |
| 6       | Grid 2          | Anode 1   | I.C.            | Grid 2  | Grid 2 & Grid 4  | Grid 2          | Screen    |
| 7       | Cathode         | Grid 1    | Anode           | Grid 3  | Grid 3           | Cathode         | Anode 1   |
| 8       | —               | Cathode 1 | Grid 3 & Screen | —       | —                | —               | —         |
| 9       | —               | Screen    | Grid 2          | —       | —                | —               | —         |
| Base    | B7G             | B9A       | B9A             | B7G     | B7A              | B7G             | B7G       |

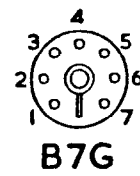
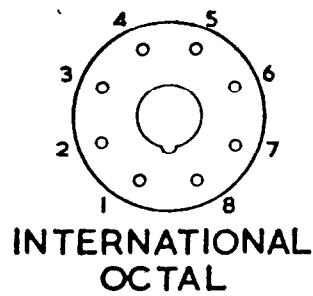
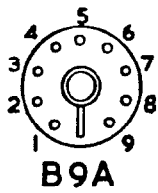
### 2.4 VALVE COMPLEMENT AND TYPICAL D.C. VOLTAGES (North American Version)

| Cct. Ref. | Function                        | Type  | Anode              | Screen   | Cathode  | Cct. Ref. |
|-----------|---------------------------------|-------|--------------------|----------|----------|-----------|
| V1        | Crystal Oscillator              | 6AU6  | 175 (5)            | 175 (6)  | 45.0 (7) | V1        |
| V2        | Harmonic Generator              | 6AU6  | 195 (5)            | 40.0 (6) | —        | V2        |
| V3        | R.F. Amplifier                  | 6ES8  | 190 (1)<br>(2)     | —        | 1.0 (8)  | V3        |
| V4        | Harmonic Mixer                  | 6AS6  | 100 (6)<br>165 (5) | 120 (6)  | 2.0 (2)  | V4        |
| V5        | First V.F.O.                    | 6AU6  | 215 (5)            | 155 (6)  | —        | V5        |
| V6        | 37.5 Mc/s Amplifier             | 6AU6  | 205 (5)            | 105 (6)  | 0.85 (7) | V6        |
| V7        | First Mixer                     | 6688  | 195 (7)            | 145 (9)  | 0.86 (1) | V7        |
| V8        | 37.5 Mc/s Amplifier             | 6AU6  | 205 (5)            | 110 (6)  | 0.81 (7) | V8        |
| V9        | Second Mixer                    | 6688  | 195 (7)            | 155 (9)  | 0.91 (1) | V9        |
| V10       | 37.5 Mc/s Amplifier             | 6AU6  | 210 (5)            | 115 (6)  | 0.91 (7) | V10       |
| V11       | Third Mixer                     | 6BE6  | 220 (5)            | 88 (6)   | 1.25 (2) | V11       |
| V12       | Second V.F.O.                   | 6AU6  | 170 (5)            | 105 (6)  | —        | V12       |
| V13       | Calibrator                      | 6BE6  | 245 (5)            | 100 (6)  | 2.05 (2) | V13       |
| V14       | First I.F. Amplifier            | 6BA6  | 195 (5)            | 60 (6)   | 0.75 (7) | V14       |
| V15       | Calibrator                      | 6BA6  | 240 (5)            | 120 (6)  | 7.0 (7)  | V15       |
| V16       | Second I.F. Amplifier           | 6BA6  | 195 (5)            | 95 (6)   | 1.55 (7) | V16       |
| V17       | I.F. Output                     | 6BA6  | 160 (5)            | 95 (6)   | 1.6 (7)  | V17       |
| V18       | A.V.C. and T.C.                 | 6AL5  | —                  | —        | 27.5 (1) | V18       |
| V19       | B.F.O.                          | 6AU6  | 190 (5)            | 150 (6)  | —        | V19       |
| V21       | Detector and Noise Limiter      | 6AL5  | —                  | —        | —        | V21       |
| V22       | Audio Output                    | 6AQ5  | 175 (5)            | 180 (6)  | 8.0 (2)  | V22       |
| V23       | Audio Amplifier and A.F. Output | 12AT7 | 220 (1)            | —        | 3.0 (3)  | V23       |
| V24       |                                 |       | 110 (6)            | —        | 1.65 (8) | V24       |

Voltages were obtained from a B9A or B7G stand-off valve base using a 20,000Ω/volt meter on the optimum range in each case. Valve pin numbers are indicated in brackets.

The receiver was set as follows:

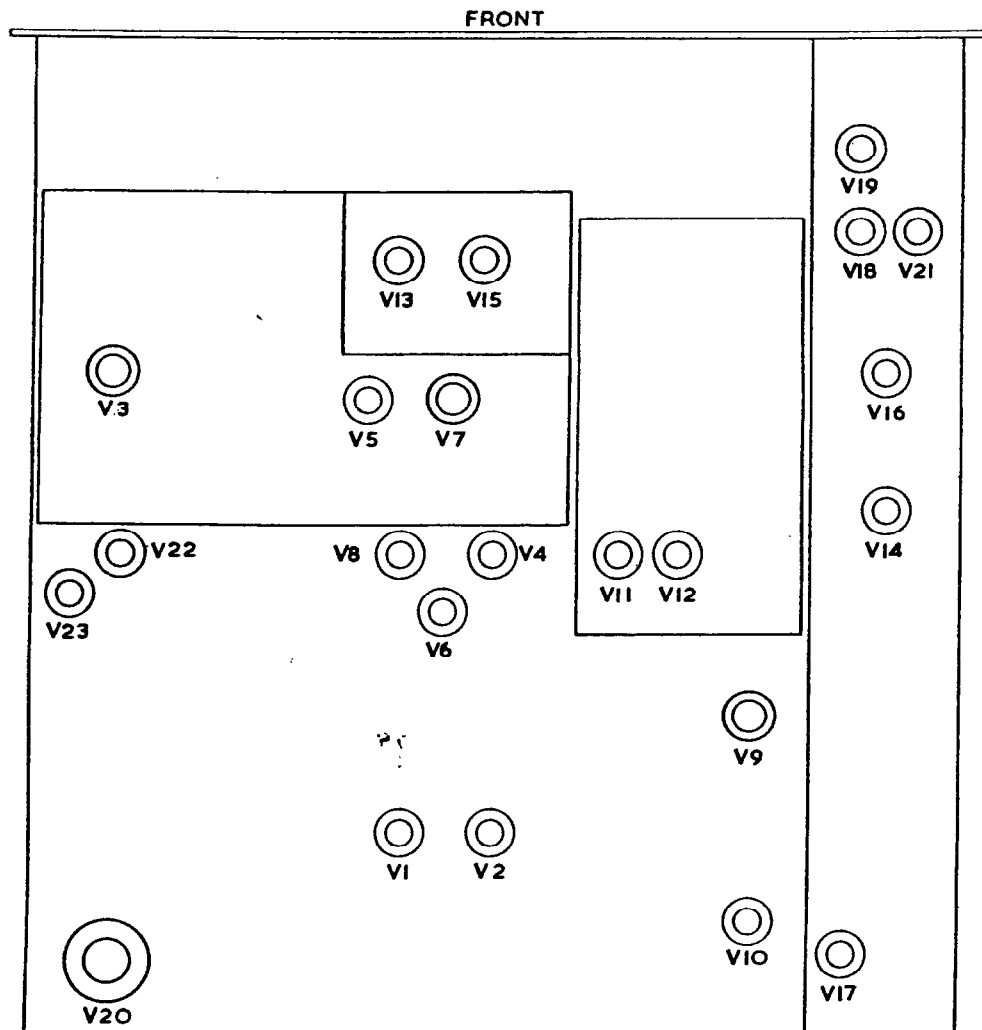
System switch to MAN.  
I.F. and A.F. GAIN to MAX.  
No signal i.e. 1st and 2nd v.f.o. off tune.  
LIMITER off.  
B.F.O. off except for checking V19.  
System switch to CAL. in order to check V13 and V15 only.



## VALVE BASE CONNECTIONS

(ALL VALVE HOLDERS VIEWED FROM UNDERSIDE)

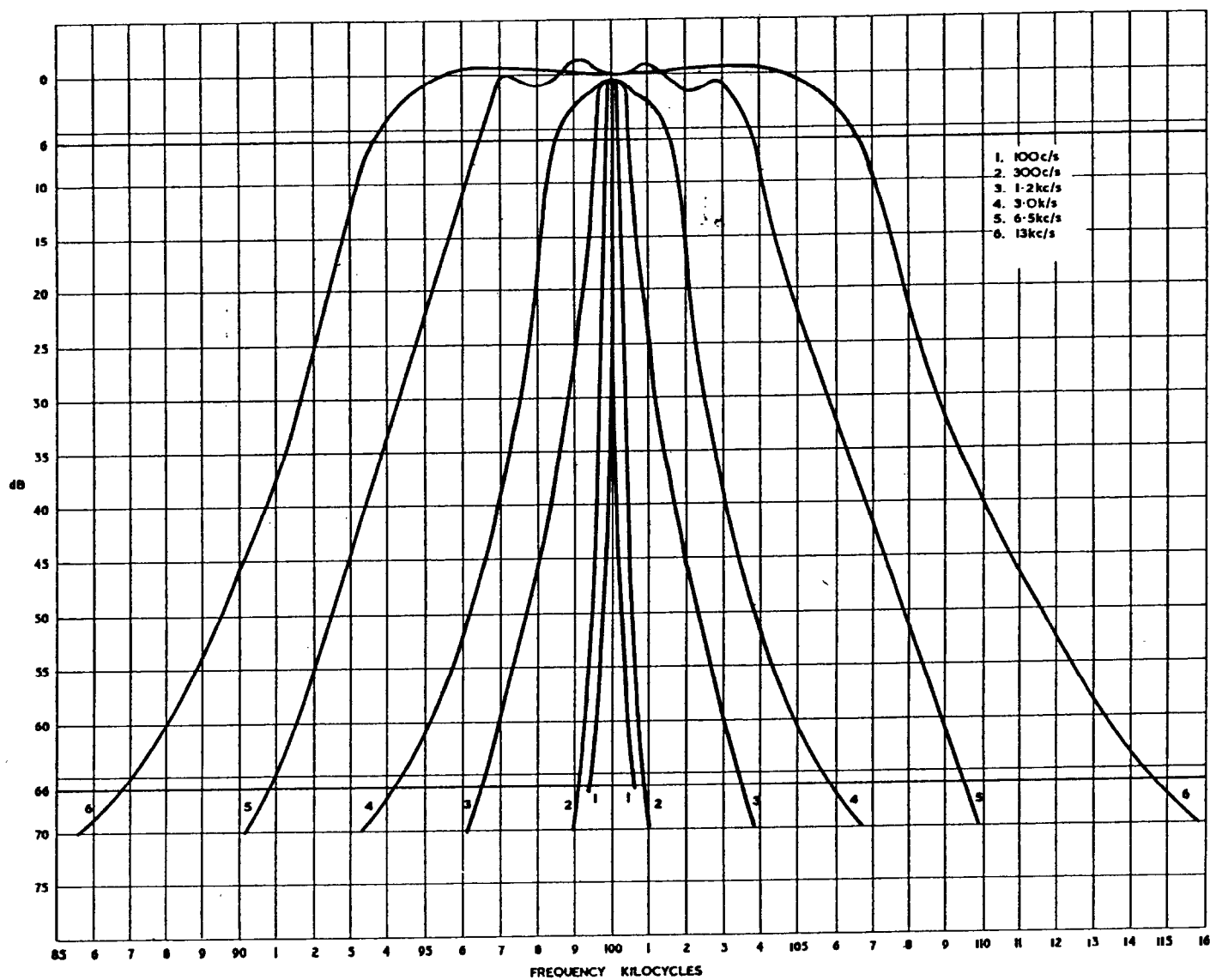
FIGURE 4



## RA17 VALVE LOCATION DIAGRAM

(VIEW FROM ABOVE)

FIGURE 5



126O15

Typical selectivity curves

Fig.6

## SECTION 3

### FAULT DIAGNOSIS

#### 3.1 INTRODUCTION

The following notes and test procedures enable the faulty section of the receiver to be determined with the minimum of delay. Unless otherwise stated the meter on the front panel is used for measuring purposes. This is set to R.F. LEVEL and the reference figure is 100 $\mu$ A for all sensitivity tests.

Since the audio stages of the receiver are conventional and accessible, normal practice will serve to trace any fault which may occur in this section.

#### 3.2 TEST EQUIPMENT REQUIREMENTS

The following test equipment will be required:

- (1) Valve Voltmeter.
- (2) 12pF trimmer capacitor.
- (3) Signal generator.

**Note:** The input capacitance of the valve voltmeter must be padded to 12pF by the trimmer or alternatively by a fixed capacitor. Before the value or the trimmer or the fixed capacitor can be selected, the input capacitance of the valve voltmeter must be known. If the trimmer is used, this should be connected across a capacitance bridge and set to the required value.

#### 3.3 FAULT DIAGNOSIS

Set the controls on the front panel as follows:—

- R.F. GAIN to max.
- I.F. GAIN to max.
- B.F.O. switch to off.
- LIMITER switch to OFF.
- System switch to MAN.

Remove the valve V12 and crystal XL1 and connect the output of the signal generator via a 0.1 $\mu$ F capacitor to pin 5 (anode) of the valve holder V12.

Set the BANDWIDTH control to 100 c/s and tune the signal generator for maximum indication in the r.f. level meter at 100 kc/s. The sensitivity should be approximately as follows:—

|                              |   |
|------------------------------|---|
| 3 kc/s less than 200 $\mu$ V | } To be within 10dB of sensitivity measured on 3 kc/s position. |
| 100 c/s                      |   |
| 300 c/s                      |   |
| 1.2 kc/s                     |   |
| 6.5 kc/s                     |   |
| 13.0 kc/s                    |   |

In the event of the figures above not being realized, the renewal of one or more of the following valves will probably effect an improvement:

- V11 3rd mixer.
- V14 first i.f. amplifier.
- V16 second i.f. amplifier.

Refit the valve V12 and connect the output of the signal generator to test point TP3. Set the BANDWIDTH control to 3 kc/s. Tune the generator for maximum at each of the following kc/s scale settings.

| Receiver kc/s scale | Signal generator              |
|---------------------|-------------------------------|
| 100                 | 2.9 Mc/s less than 10 $\mu$ V |
| 500                 | 2.5 Mc/s less than 10 $\mu$ V |
| 800                 | 2.2 Mc/s less than 10 $\mu$ V |

The maximum difference between check points should not exceed 3dB. The renewal of V11 or V9 will probably effect an improvement if this figure is not met, providing that the conditions outlined in previous paragraphs have been achieved. If the figures vary by more than 3dB between check points, the 2–3 Mc/s band-pass filter C122, C125, C128, L57, L58 and L59/60 should be carefully re-aligned as detailed under "Alignment Procedures" (Section 5, para. 5.5).

Refit the crystal XL1 and check the 1 Mc/s output (PL3A at the rear of the receiver) with the valve voltmeter to ensure that there is at least 2V output.

Remove the valve V9 and connect the valve voltmeter to test point TP3. Tune the MEGACYCLES dial slowly through each Mc/s point when at least 2V should be indicated on the voltmeter at each point. Absence of drive at this point or a low reading indicates a possible fault in any one of the following valves or the associated circuitry:

V2, V4, V6, V8, V10 and V5.

With V9 and the crystal XL1 removed and the valve voltmeter connected to TP3, connect the output of the signal generator at a frequency of 3.5 Mc/s to the aerial socket. With the AE. RANGE switch set to WIDEBAND and the AE. ATTENUATOR set to MIN, peak the MEGACYCLES tuning at 3 Mc/s for maximum on the valve voltmeter. The input required for 0.5V should be less than 250mV. If this figure cannot be achieved V1 and V7 may have low emission or a fault may exist in the associated circuit.

Low r.f. channel gain may be caused by a failure in the 40 Mc/s band-pass filter. This, however, is extremely unlikely and no attempt should be made to touch this section unless a wobulator is available.

The aerial, r.f. circuits and low-pass filter may be by-passed by feeding in a signal to test point TP2 on the first v.f.o. chassis.

Should the fault be traced to a section where alignment will be affected by servicing, reference should be made to the relevant part in Section 5.

Voltages on valves where the bases are inaccessible are measured by the use of short "stand offs"

A.E.

# SECTION 4

## REPRESENTATIVE TEST DATA

| <i>Signal Input to :</i>                                   | <i>Frequency</i>                                | <i>Input</i>        | <i>Output</i>  | <i>Remarks</i>  |
|--|---|---------------------|--|---|
| (a) Grid V22   | 1,000 c/s                                       | 0.3V                | 50mW in 3Ω   | } AUDIO GAIN MAX.<br>A.F. LEVEL MAX.<br>I.F. GAIN MIN.<br>B.F.O. off.<br>LIMITER off.   |
| Grid V23   | 1,000 c/s                                       | 0.35V               | 10mW in 600Ω<br>(Output to line)                         |   |
| (b) Grid V16   | 100 kc/s c.w.                                   | 360mV               | 100μA R.F. level   | } B.F.O. off.<br>System Switch MAN.<br>I.F. GAIN MAX.<br>1 Mc/s crystal removed.<br>Mc/s scale set to 20.<br>BANDWIDTH 3 kc/s.  |
| Grid V14   | 100 kc/s c.w.                                   | 850μV               | 100μA R.F. level   |   |
| Anode Connection<br>of V12 via 0.1μF<br>with valve removed | 100 kc/s c.w.                                   | 100μV               | 100μA R.F. level   |   |
| (c) Grid of second mixer<br>(TP3)                          | 2.2 Mc/s c.w.<br>2.5 Mc/s c.w.<br>2.9 Mc/s c.w. | 7μV<br>7.5μV<br>7μV | 100μA R.F. level<br>100μA R.F. level<br>100μA R.F. level | } Image response (i.e. receiver<br>frequency plus 200 kc/s)<br>should be at least 60dB down.  |
| (d) Aerial input<br>(WIDEBAND)                             | 3.5 Mc/s c.w.                                   | 250mV               | 0.5V at TP2  |   |
|  |   |                     |  |   |
| (e) Aerial Input<br>(WIDEBAND)                             | 3.5 Mc/s c.w.                                   | 250mV               | 0.5V at TP3  | } WIDEBAND INPUT.<br>AE (ANT.) ATTENUATOR<br>MIN.<br>V5 and V7 removed.<br>Valve voltmeter input shunt-<br>ed to 12pF.  |
|  |   |                     |  |   |
|  |   |                     |  |   |
| (f) Grid V10   | 37.5 Mc/s c.w.                                  | 40mV                | 1V at TP3  | } WIDEBAND INPUT.<br>AE (ANT.) ATTENUATOR<br>MIN.<br>V5 and V7 replaced.<br>V9 and 1 Mc/s crystal re-<br>moved.<br>Valve voltmeter input shunt-<br>ed to 12pF.<br>MEGACYCLES scale 3. |
| Grid V8  |   | 25mV                |  |   |
| TP1  |   | 2.8mV               |  |   |

(g) With the 1 Mc/s crystal in place, the output at plugs PL2 and PL3 should be approximately 2 volts.

(h) The level of the 37.5 Mc/s drive at TP3 should be between 2 and 10 volts at any MEGACYCLE setting.

## ALIGNMENT PROCEDURES

## 5.1 GENERAL

The receiver will, under normal conditions, maintain the factory alignment over an extremely long period of time. Consequently ALL POSSIBILITY OF OTHER CAUSES OF TROUBLE SHOULD BE ELIMINATED BEFORE RE-ALIGNMENT IS CONSIDERED.

If it becomes necessary to re-align any part of the receiver, only a very small angular adjustment of any trimmer should be necessary. The signal generator must have a high degree of frequency resetting accuracy and be very stable.

Unless otherwise stated, the panel-mounted R.F. Level meter is used as the output indicator.

## 5.2 100 kc/s I.F. STRIP

## (a) First and Second I.F. Amplifier

Remove the second v.f.o. valve V12. Set the System switch to MAN, the I.F. GAIN to MAX and the meter switch to R.F. LEVEL. Connect the signal generator (100 kc/s c.w.) via a  $0.1\mu\text{F}$  capacitor to the grid of V16 (Pin 1). Adjust C195B to obtain maximum indication on the meter. The output from the generator required to produce  $100\mu\text{A}$  deflection on the meter should be approximately 320mV. Connect the signal generator via a  $0.1\mu\text{F}$  capacitor to the grid of V14 (Pin 1) and connect a  $4.7\text{k}\Omega$  damping resistor across L72. Adjust C179 and C195B to give maximum indication.

Remove the  $4.7\text{k}\Omega$  resistor from L72 and connect it across L73. Adjust C171 for maximum indication. Remove the  $4.7\text{k}\Omega$  resistor. The signal generator output required to produce a  $100\mu\text{A}$  deflection should be approximately 800 $\mu\text{V}$ . Tune the signal generator through the passband and note the 'double peak' response. The peak separation should be approximately 9 kc/s and be symmetrical about 100 kc/s. If the peak amplitudes differ, slight re-adjustment of C191 will compensate for this. The 6dB bandwidth should be approximately 14 kc/s.

## (b) 100 kc/s (L-C) Filter

Remove the second v.f.o. valve V12 and set the controls as in 5.2 (a). Connect the output of the signal generator (100 kc/s) via a  $0.1\mu\text{F}$  capacitor to pin 5 (anode) of V12. Remove the L-C filter can. Locate the two red free-ended leads connected at one end of the trimming capacitors C153 and C158 in the second and third sections of the filter and connect the free ends to their respective 470k damping resistor R77 and R80 at the terminal post ends. Replace the filter can. Set the bandwidth to 100 c/s. Tune the signal generator to give maximum indication in the R.F. LEVEL meter then switch to 1.2 kc/s. The frequency of this setting should be within  $\pm 100$  c/s of 100 kc/s. Adjust the trimming capacitors C162, C158, C153 and C147 in this order several times until maximum output is obtained.

Remove the L-C filter can and disconnect the red leads from the terminal post ends of the 470k $\Omega$  resistors. Replace the filter can. Set the controls of the signal generator for an output of 225 $\mu\text{V}$  approximately for  $100\mu\text{A}$  in the R.F. LEVEL meter. Check that the bandwidths agree (approximately) with the following figures:—

| —6dB      | —66dB              | Sensitivity for $100\mu\text{A}$ |
|-----------|--------------------|----------------------------------|
| 100 c/s   | Less than 1.5 kc/s | 150 $\mu\text{V}$                |
| 300 c/s   | Less than 2.0 kc/s | 200 $\mu\text{V}$                |
| 1.2 kc/s  | 8 kc/s             | 225 $\mu\text{V}$                |
| 3.0 kc/s  | 15 kc/s            | 160 $\mu\text{V}$                |
| 6.5 kc/s  | 20 kc/s            | 200 $\mu\text{V}$                |
| 13.0 kc/s | 28 kc/s            | 350 $\mu\text{V}$                |

## (c) Crystal Filter

Remove the second v.f.o. valve V12 and set the controls as in 5.2 (a). Set the BANDWIDTH switch to 300 c/s. Connect the signal generator via a  $0.1\mu\text{F}$  capacitor to pin 5 (anode) of V12. Tune the signal generator slowly through the pass-band and observe the crystal responses (f1 and f2). Care must be taken as the tuning of these is very sharp. Retune the signal generator to the mean of f1 and f2 and adjust C110 and C148 for maximum output. Reset the signal generator frequency to 100 kc/s and adjust the output to produce a reading of  $100\mu\text{A}$ . Set the generator frequency to 101,025 c/s, increase the output by 66dB and adjust the phasing control C119 to obtain minimum output (i.e. the point of rejection occurs). Increase the generator frequency slowly and ascertain that the meter reading does not exceed  $100\mu\text{A}$ . Slowly decrease the signal frequency until  $100\mu\text{A}$  reading is obtained and check that the frequency is not greater than 100,900 c/s. Tune through the pass-band, adjusting the signal generator output as necessary to avoid meter damage. Note the highest frequency at which a signal generator output equal to that used at 101,025 c/s gives an output of  $100\mu\text{A}$ . This frequency should not be less than 99,100 c/s.

Slowly decrease the signal frequency and ensure that the output does not rise above  $100\mu\text{A}$ . Decrease the generator output by 66dB and re-check the frequency response within the pass-band, re-adjusting C110 and C148 if necessary. Set the signal generator frequency to 100 kc/s and adjust the output for  $100\mu\text{A}$  level. Increase the signal generator output by 6dB and check the bandwidth for  $100\mu\text{A}$  output. The bandwidth should be between 270 and 330 c/s and the mid-position should not deviate from 100 kc/s by more than 25 c/s. The sensitivity should be approximately 200 $\mu\text{V}$  for  $100\mu\text{A}$  deflection.

Switch the BANDWIDTH control to 100 c/s. Repeat the procedure with signal generator frequency settings of 100,925 c/s, 100,800 c/s and 99,200 c/s. Adjust the phasing capacitor C118 only. The 6dB bandwidth should be between 80 and 120 c/s, and the deviation from the mean less than 25 c/s. For 100 $\mu$ A output, the input should be approximately 150 $\mu$ A.

Disconnect the signal generator and refit V12.

#### (d) Use of Digital Frequency Meter

The alignment of the i.f. strip and in particular the crystal filter involves the measurement of frequencies to far greater accuracies than those normally obtainable from signal generators. A digital frequency meter should therefore be employed. The equipment should be connected to SK8 or SK9. The exact frequency passing through the circuit will be displayed on the indicator panel. Should the level of output at any time during the alignment procedure be insufficient to drive the frequency meter, the signal generator output can be increased to obtain the frequency check but must be restored to the lower value for level measurements. When such increases are made, the meter on the receiver panel should be switched to A.F. LEVEL to avoid damage.

### 5.3 SECOND V.F.O.

#### (a) Minor Corrections

The variable capacitor has been carefully adjusted and should not be readjusted unless absolutely necessary. Minor corrections can be made as follows:—

- (i) Set the System switch to CAL.
- (ii) Set the KILOCYCLES cursor in line with the MEGACYCLES cursor (*i.e.* central).
- (iii) Ensure that the B.F.O. switch is off.
- (iv) Rotate the I.F. GAIN to MAX.
- (v) Set the BANDWIDTH switch to 3 KC/S.
- (vi) Set the KILOCYCLES scale to zero (0 KC/S) and adjust the capacitor C136 to give zero-beat note in the loudspeaker.

**Note:** The capacitor C136 is obscured by V16.

- (vii) Set the KILOCYCLES scale to that zero-beat point which is nearest to the 1,000 KC/S position.
- (viii) Lock the drive sprocket.

- (ix) Adjust the position of the film scale to produce correct calibration.

**Note:** When moving the film scale relative to the sprockets, grip both sides of the film scale in order to create a loop which will allow the film to slide round the drive sprocket; the drive sprocket is on the left when facing the receiver and hence movement of the film scale will have to be to the left.

- (x) Repeat (vi) to (ix) until an adequate degree of accuracy is obtained.

**Important Note:** The tuning slug of L55 has been sealed by the manufacturer and must not be touched under any circumstances.

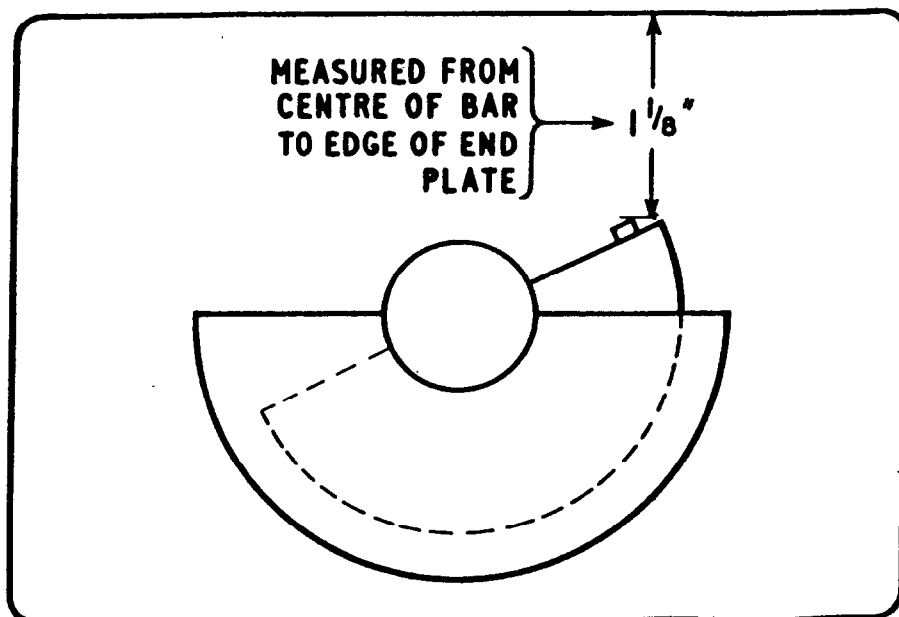


FIGURE 7



**(b) Replacement of Ganged Capacitor**

The procedure described below should not normally be carried out unless the ganged capacitor is being replaced. Before electrical adjustment, the following mechanical points should be verified :—

- (i) Set the KILOCYCLES scale against the mechanical end stop at the 1,000 kc/s end and check that the ganged capacitor is set as shown in Figure 7.
- (ii) Check that the distance from the cursor to the extreme end of the scale, adjacent to the 1,000 kc/s point, is approximately  $\frac{1}{2}$ -in. Should this distance vary appreciably from  $\frac{1}{2}$ -in., carefully lift the scale from the drive and move the scale round to the required position.
- (iii) Whenever the film scale is replaced, endeavour to re-align by adjusting the film to the correct position before trimming.

The procedure for electrical adjustment is carried out as follows:—

- (iv) Proceed as in 5.3 (a) above.
- (v) Check the calibration of the v.f.o. at 100 kc/s intervals; if the error exceeds 1 kc/s, adjust carefully the two outer plates of the rotor of the oscillator section of the ganged capacitor in order to correct the calibration.

**Note:** The oscillator capacitor C139 is the second section from the rear of the ganged capacitor unit.

**5.4 B.F.O.**

Set the System switch to the CHECK B.F.O. position. Switch the meter switch to R.F. LEVEL. Switch the b.f.o. on and set the b.f.o. frequency control knob to zero. Adjust C201 as necessary to obtain zero-beat. Observe that the meter reads approximately half f.s.d.

If the b.f.o. frequency control knob has been removed, adjust the frequency capacitor for zero-beat with the identification mark on the shaft uppermost. Replace the knob so that the pointer indicates zero.

**5.5 SECOND I.F. CIRCUIT**

Set the System switch to MAN. Remove the 1 Mc/s crystal. Set the I.F. GAIN to MAX. Set the METER switch to R.F. LEVEL. Connect the signal generator (c.w. output) to TP3. Alignment frequencies are 2.2 and 2.9 Mc/s which correspond to 800 and 100 kc/s respectively on the KILOCYCLES dial. Adjust C122, C125 and C128 at 100 kc/s and L57, L58 and L59 at 800 kc/s. Repeat as necessary until alignment is correct at both ends of the band. The input required for 100 $\mu$ A meter deflection should be between 5 and 10 $\mu$ V.

**5.6 37.5 Mc/s FILTER AND AMPLIFIER**

Remove the 1 Mc/s crystal, second mixer valve V9 and the first v.f.o. valve V5. Check that all the screening covers are in place. Connect a suitable valve voltmeter, shunted to 12pF, to TP3. Inject an accurate 37.5 Mc/s signal at TP1. Ensure the valve voltmeter and signal generator leads are short to avoid regeneration. Adjust L50, C90, C81, C72, C63, C55, C45, C35, C24, L28 and L33 in that order, several times, to obtain maximum output. The input required to produce 1V should be approximately 2.5mV. The 6dB bandwidth of the 37.5 Mc/s chain should lie between 229–300 kc/s. The bandwidth at 40dB should not exceed 750 kc/s. The mean of the frequencies corresponding to the 6dB points should not deviate from 37.5 Mc/s by more than 20 kc/s and by more than 25 kc/s at 40dB bandwidth.

C108 is adjusted to avoid interaction between the 37.5 and 40 Mc/s filters and should not normally require further adjustment. Replace the 1 Mc/s crystal, the second mixer and the first v.f.o. valve.

**5.7 1 Mc/s CRYSTAL OSCILLATOR**

Connect the valve voltmeter to the 1 Mc/s output plug PL2 and adjust L2 for maximum output (2–3V). C2 may be adjusted to 'pull' the crystal to the correct frequency. Adjustment of the crystal frequency should not be attempted unless a standard of accuracy better than one part in  $10^7$  is available.

**5.8 SECOND MIXER DRIVE LEVEL**

Remove the second mixer valve V9. Connect the valve voltmeter, shunted to 12pF, to TP3. Tune through each megacycle calibration point and check that the level of each output lies between 2 and 10V. To equalise the drive at 28 and 29 Mc/s carefully adjust C7.

**5.9 FIRST V.F.O. CALIBRATION**

Slacken off the mechanical end-stop until it is inoperative. Set C76 to maximum capacity and ensure that the calibration mark at the zero end of the MEGACYCLES dial coincides with the cursor. Tighten end-stop after moving the scale free from the stop. Check that the mechanical stops operate before the capacitor end-stops become effective at both ends of the band.

To readjust the first v.f.o. calibration, a heterodyne wavemeter should be employed. This is coupled very loosely to V7 by placing its input lead in the vicinity of the valve base. The 1 Mc/s crystal and V12 should be removed.

Set the wavemeter to 40.5 Mc/s and the MEGACYCLES dial to zero. Adjust L36 for zero-beat. Change the wavemeter setting to 69.5 Mc/s and the MEGACYCLES dial to 29. Adjust C77 for zero-beat. Repeat adjustment as necessary. Check the frequency calibration at 1 Mc/s intervals and ensure that the megacycle positions are reasonably central on the scale markings. Remove the first mixer valve V7 and connect the valve voltmeter, shunted to 12pF, between TP2 and the chassis. Check that the valve voltmeter indicates at least 1.5V over the range. Replace the 1 Mc/s crystal, V12 and V7.

### 5.10 AERIAL CIRCUIT

Remove the first v.f.o. valve V5 and the first mixer valve V7 and set the receiver controls as follows:—

AE. ATTENUATOR to MIN.

AE. RANGE Mc/s to 0.5 Mc/s

System switch to MAN.

I.F. GAIN to MAX.

Remove the screening cover from around C18A/B and connect a 1 kilohm resistor across the secondary section (C18B rear section). Set the AE. TUNE control to approximately  $\frac{3}{4}$ ths of its travel in a clockwise direction.

Connect the valve voltmeter, shunted to 12pF, between TP2 and chassis. Connect the output of the signal generator to the aerial input socket. Set the generator for a frequency of 0.5 Mc/s.

Remove the top core from the transformer L9 and adjust the primary core for a maximum deflection in the valve voltmeter. (The position of this core should be such that it tunes at a point nearest the bottom of the transformer).

Remove the 1 kilohm resistor from the secondary section and connect it across the primary section of C18.

Refit top core (secondary) and adjust it for a maximum deflection in the valve voltmeter.

Remove the 1 kilohm resistor from the primary of C18.

Reset the signal generator frequency to 1 Mc/s and adjust the AE. TUNE control (C18) for maximum output in the valve voltmeter then adjust the trimmer capacitor C232 for a maximum deflection in the valve voltmeter also check for symmetrical response.

Repeat the above procedure for the AE. RANGE switch settings and frequencies listed below.

| AE. RANGE | ALIGNMENT FREQUENCY      |           | INDUCTANCE |
|-----------|--------------------------|-----------|------------|
|           | Primary                  | Secondary |            |
| 1-2       | 1 Mc/s                   | 2 Mc/s    | L8         |
| 2-4       | 2 Mc/s                   | 4 Mc/s    | L7         |
| 4-8       | 4 Mc/s                   | 8 Mc/s    | L6         |
| 8-16      | 8 Mc/s                   | 16 Mc/s   | L5         |
| 16-30     | 13 Mc/s<br>(C18 at max.) | 30 Mc/s   | L4         |

Maximum voltage input for 0.5 volt output.

| AE. RANGE  | L.F. | H.F. |
|------------|------|------|
| 0.5-1 Mc/s | 6mV  | 6mV  |
| 1-2 Mc/s   | 7mV  | 7 mV |
| 2-4 Mc/s   | 10mV | 10mV |
| 4-8 Mc/s   | 12mV | 16mV |
| 8-16 Mc/s  | 22mV | 26mV |
| 16-30 Mc/s | 22mV | 30mV |

### 5.11 CRYSTAL CALIBRATOR

Should no output be obtained from this unit when the System switch is in the CAL position and the KILOCYCLES scale set at a 100 kc/s check point, or if spurious responses are obtained over the kilocycles range, proceed as follows:—

Set the KILOCYCLES scale to a 100 kc/s point and check the tuning of L70 by carefully rotating the core a half-turn either side of the setting. If the signal does not appear, restore the core to its original setting and repeat the check with L75. If the signal is heard, the cores of L70 and L75 should be set to the centre of the range of adjustment over which a clean signal is produced.

Should a major fault be suspected, or if L70 or L75 have been inadvertently misaligned, it will be necessary to remove the unit and make up an extension cable so that the unit may be operated outside the receiver. The crystal calibrator may be aligned as follows:—

Remove V13 and connect the valve voltmeter probe to grid 3 (Pin 7). Inject a 900 kc/s c.w. signal, from the signal generator, at the grid of V15 (Pin 1) and adjust L75 for maximum output. Disconnect the valve voltmeter and the signal generator, replace V13 and remove V15. Connect the signal generator to grid 1 (Pin 1) of V13 and the valve voltmeter to the grid 1 connection (Pin 1) of V15. Set the signal generator to 100 kc/s c.w. and adjust L70 for maximum indication on the valve voltmeter. Disconnect the valve voltmeter and the generator. Replace V15. Connect the coaxial connector to SK2 on the receiver.

The output should be approximately 0.2V measured between Pin 6 of the octal plug and earth.

### 5.12 40 Mc/s FILTER

This filter is over-coupled and cannot be readily aligned without a 40 Mc/s sweep oscillator. Readjustment therefore should not be attempted unless the specially designed test equipment and factory-type alignment jigs are available.

### 5.13 RECEIVER OVERALL GAIN TEST

#### Test Equipment required:

Audio power Meter similar to Marconi TF 893A  
Signal Generator similar to Marconi TF 144H  
Terminating Resistors various (see text).

**Note:** The signal generator used must have an output impedance of  $75\Omega$ . If this is not available a matching pad should be inserted between the signal generator and the receiver and the output voltage of the signal generator increased by a factor depending on the attenuation introduced by the matching pad in use.

To perform an overall gain (sensitivity) test proceed as follows:—

(1) Set the controls on the receiver as follows:—

|                |                 |
|----------------|-----------------|
| AE. RANGE      | 2-4             |
| MEGACYCLES     | 3               |
| KILOCYCLES     | 500             |
| AE. ATTENUATOR | Min.            |
| System Switch  | MAN             |
| BANDWIDTH      | 3 Kc/s          |
| B.F.O. Switch  | ON              |
| B.F.O. Note    | 1 Kc/s          |
| I.F. GAIN      | Fully clockwise |

- (2) Set the controls of the output meter for  $600\Omega$  impedance and a range of 6mW. Connect the output meter across one of the  $600\Omega$  3mW. windings and terminate the other windings with resistors to match their marked impedance.
- (3) Set the controls of the signal generator for a C.W. output of 1 microvolt at 3.5 Mc/s and an impedance of  $75\Omega$ . Connect the output of the signal generator to the aerial input of the receiver.
- (4) Tune the receiver to the output frequency of the signal generator and check that a reading of 3mW. can be obtained within the range of the A.F. GAIN control.
- (5) Repeat the test with the B.F.O. switched off and a 30% modulated signal at a level of 3.5 microvolts from the signal generator.

## DISMANTLING AND REPLACEMENT PROCEDURES

## 6.1 UNIT BREAKDOWN

The receiver may be rapidly dismantled to six sub-units as follows:—

1. **Front Panel**
  - (1) Tuning escutcheon.
  - (2) Loudspeaker and escutcheon.
  - (3) Output level meter.
2. **Second Variable Frequency Oscillator**
  - (1) 2–3 Mc/s band-pass filter.
  - (2) Second v.f.o. (V12).
  - (3) Third mixer (V11).
3. **First Variable Frequency Oscillator**
  - (1) R.F. amplifier (V3).
  - (2) First v.f.o. (V5).
  - (3) First mixer (V7).
4. **100 Kc/s I.F. Strip**
  - (1) Beat frequency oscillator (V19).
  - (2) Crystal filter.
  - (3) L–C filter.
  - (4) First and second i.f. amplifiers (V14 and V16).
  - (5) A.V.C. and T.C. stages (V18).
  - (6) Detector and noise limiter (V21).
  - (7) 100 kc/s output (V17).
5. **Crystal Calibrator (V13 and V15).**
6. **Main Chassis**
  - (1) Aerial (antenna) attenuator.
  - (2) Crystal oscillator (V1).
  - (3) Harmonic generator (V2).
  - (4) 30 and 32 Mc/s low-pass filters.
  - (5) 37·5 and 40 Mc/s band-pass filters.
  - (6) Harmonic mixer (V4).
  - (7) The 37·5 Mc/s amplifiers (V6), (V8) and (V10).
  - (8) Second mixer (V9).
  - (9) A.F. output stages (V22) and (V23).
  - (10) Power supplies (V20).

## 6.2 DISMANTLING AND REPLACEMENT INSTRUCTIONS

1. **Front Panel**
  - (1) Remove all control knobs.
  - (2) Unscrew the eight instrument head panel fixing screws.  
**Note:** The two at the bottom of the front panel, adjacent to the jack sockets are secured to the main chassis with nuts.
  - (3) Carefully withdraw the front panel and unsolder the connections to the meter and speaker switches; alternatively, the number of wires to be unsoldered can be minimised (loudspeaker only) by removing the securing nuts on the SPEAKER and METER switches and also the nuts securing the solder tags on the rear of the meter. The panel may now be completely removed.  
**Note:** When replacing the B.F.O. NOTE control knob, ensure that the identification mark on the shaft is uppermost and that the pointer indicates zero when zero-beat is obtained.
2. **Second Variable Frequency Oscillator**
  - (1) Remove the bottom cover.
  - (2) Unsolder the three connections on the 4-way tag strip, adjacent to the terminal strip, situated in compartment 6 (see illustration 1: Key to Under-chassis Layout).
  - (3) Remove the front panel: see 1 above.
  - (4) Withdraw the Crystal Calibrator Unit by slackening the knurled nuts, disconnecting the coaxial cable and unplugging the unit.
  - (5) Unbolt the cable cleat securing the dial light cable.
  - (6) Unclip the lampholder.
  - (7) Disconnect the coaxial cables.
  - (8) Remove the screws securing the Megacycles dial to the boss and withdraw the dial.  
**Note:** Do not unscrew the boss from the shaft. Unscrew the second v.f.o. cover and the two unit retaining screws (indicated in illustration 7).

- (9) The v.f.o. may now be withdrawn vertically. When servicing this assembly, clean the wormwheel and the split gear on the ganged capacitor shaft with carbontetrachloride, then apply with a brush, to the wormwheel only (illustration 6), a thin coating of Molybdenum Disulphide grease (Rocol "Molypad").

(a) Removal of Kilocycles film scale:—

- (i) Rotate the KILOCYCLES knob to the 1000 KC/S end stop.
- (ii) Remove the front panel:—see 1 above.
- (iii) While firmly holding the two gears situated above the film bobbins, remove the plate carrying the fibre idler gear.
- (iv) Allow the two gears to unwind slowly.
- (v) Unwind the film scale.

(b) To fit a new film scale:—

- (i) Pass the 1000 KC/S end round the drive sprocket and wrap the end round the split pin on the inner bobbin; rotate this bobbin until most of the film scale is wound.
- (ii) Wrap the other end of the film scale round the split pin on the other bobbin, and rotate the bobbin counter-clockwise until the film scale is taut.
- (iii) Wind the gears in opposite directions for  $\frac{3}{4}$  to 1 turn, and while holding the gears under tension re-engage the idler gear.
- (iv) Secure the plate by the two fixing screws.
- (v) To check calibration, see second v.f.o. alignment procedure (Section 5.3).

(c) Ganged Capacitor

Note: Refer to the second v.f.o. alignment procedure (Section 5.3) before attempting to replace the ganged capacitor.

- (i) Remove the second v.f.o. from the receiver in accordance with the instructions above.
- (ii) Remove the KILOCYCLES scale.
- (iii) Unscrew the remaining cover plate and the under chassis screen.
- (iv) Unsolder the capacitor connections.
- (v) Remove the drive gear and collet.
- (vi) Unscrew the three fixing screws holding the capacitor to the bracket; ensure that the anti-backlash gears are loaded.

3. First Variable Frequency Oscillator

- (1) Remove the front panel, the bottom cover and the screens from compartments 3, 8 and 13. (See illustration 1: Key to Under-Chassis Layout).
- (2) Unsolder the connecting wires from the two turret lugs situated in compartment 3, the leads to the turret lug in compartment 8, the pin connections in compartment 5 and the screened cable in compartment 13.
- (3) Unscrew the three fixing screws on the top of the unit.

(a) To fit a new chain:—

- (i) Take a 63-link length of chain.
- (ii) Hold chain tension sprocket down towards the chassis, and fit new chain round the two chain wheels.
- (iii) Release the tension sprocket ensuring that it holds the chain under tension. See Front Panel instructions regarding refitting of B.F.O. NOTE control knob: Section 6.2.

4. 100 Kc/s I.F. Strip

- (1) Remove the left-hand gusset plate adjacent to the unit.
- (2) Unsolder the leads to the 4 and 12-way tag strips and the 100 KC/S OUTPUT plugs.
- (3) Disconnect the coaxial lead to the second v.f.o.
- (4) Remove the six screws securing this unit to the main chassis.

Note: Removal of the I.F. GAIN control on the b.f.o. assembly is necessary in order to obtain access to one of the six securing screws.

(a) Beat Frequency Oscillator

- (i) Remove Front Panel.
- (ii) Remove bottom cover.
- (iii) Disconnect leads from I.F. GAIN potentiometer.
- (iv) Remove side plates adjacent to i.f. strip.
- (v) Remove screw securing cable cleat situated adjacent to 150mH choke assembly on underside of i.f. strip.
- (vi) Disconnect red-white lead of b.f.o. cableform from terminal on adjacent 12-way tag strip.
- (vii) Withdraw red-white lead from cableform.
- (viii) Disconnect brown leads from pin 4 of V18 socket.
- (ix) Disconnect yellow leads from pin 7 of V21 socket.
- (x) Remove remaining three 6 B.A. screws and crinkle washers to release b.f.o. assembly from i.f. strip chassis.

6.3 VALVE REPLACEMENT

With the exception of V5, replacement of valves will not affect receiver alignment.

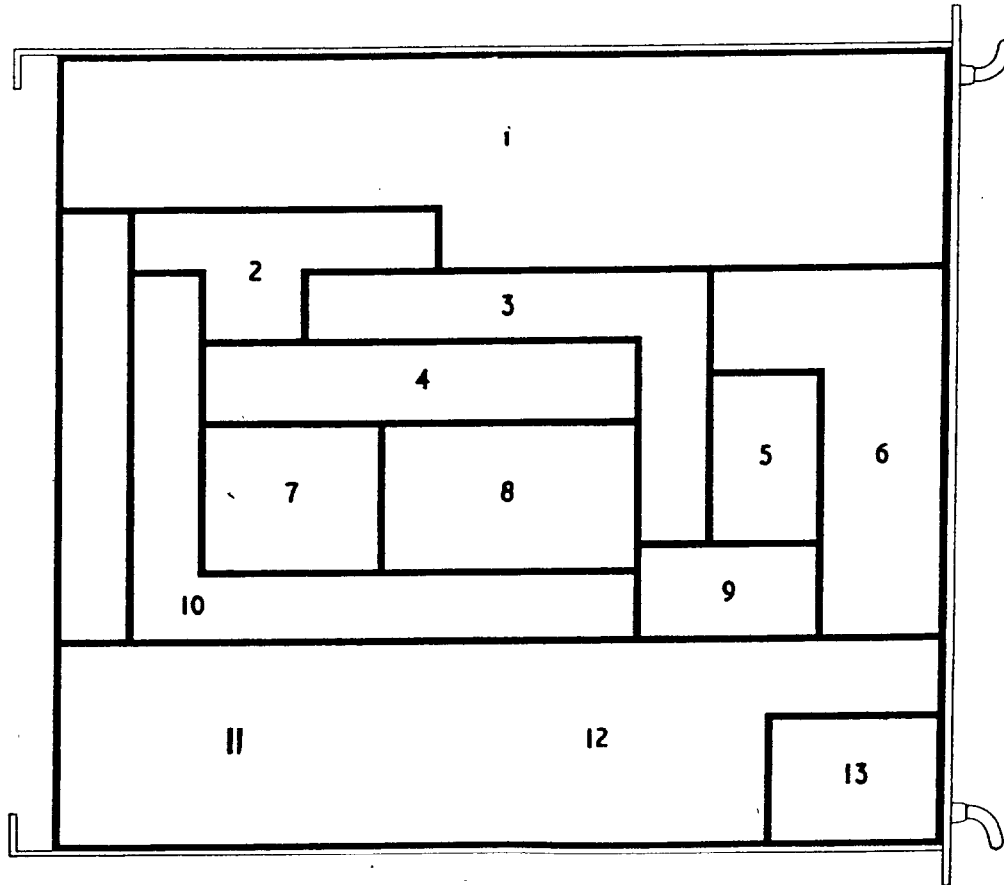
When V5 is replaced refer to Part I, Section 5.

## SECTION 7

### ILLUSTRATIONS

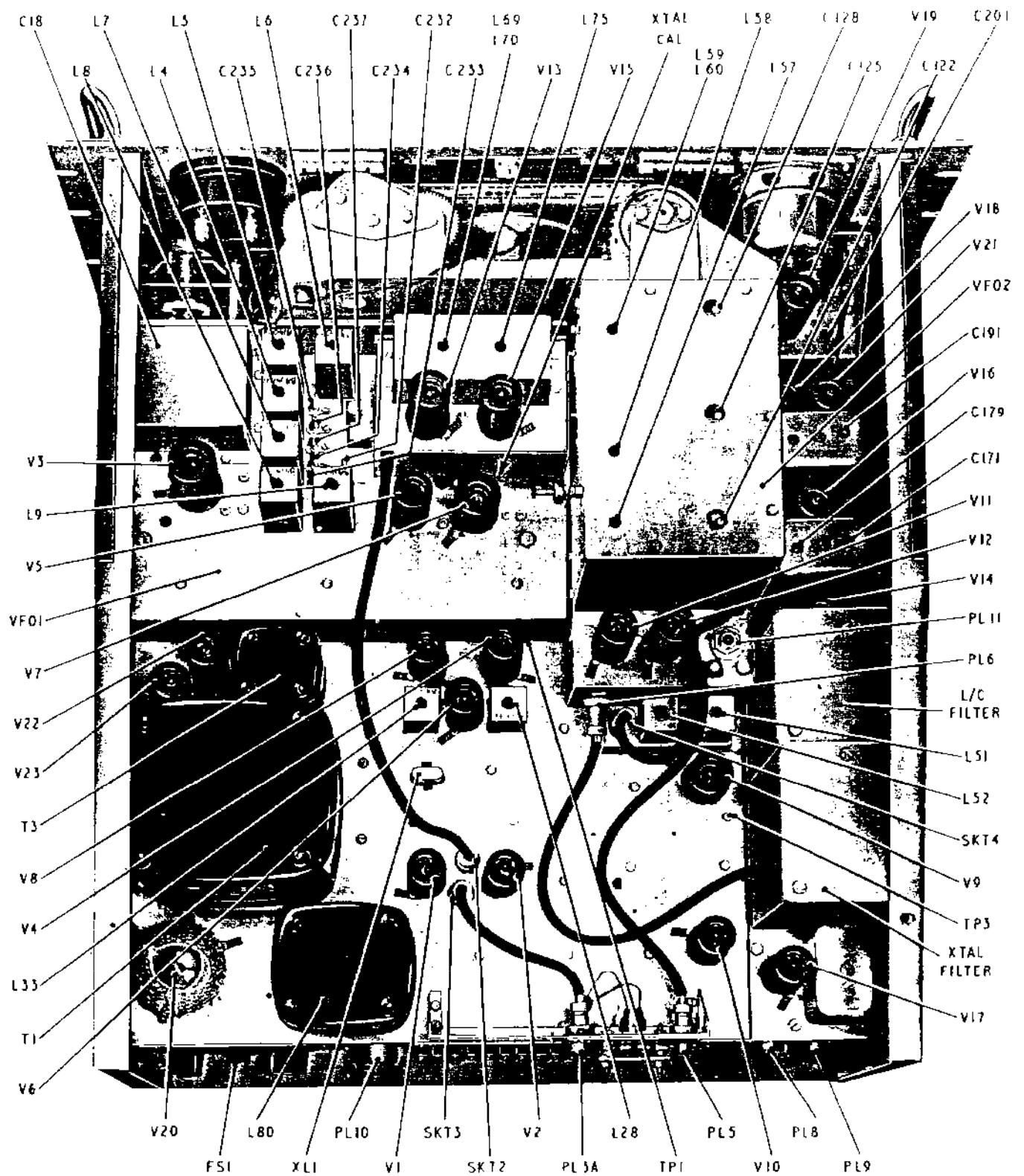
|  | <i>Illustration</i> |
|--|---------------------|
| Key to Under-Chassis Layout . . . . .                              | 1                   |
| Chassis Assembly, Top . . . . .                                    | 2                   |
| Chassis Assembly, Underside . . . . .                              | 3                   |
| Crystal Oscillator and Harmonic Filter System, Underside . . . . . | 4                   |
| First V.F.O. Unit, Underside . . . . .                             | 5                   |
| Second V.F.O. Unit, Front . . . . .                                | 6                   |
| Second V.F.O. Unit, Rear . . . . .                                 | 7                   |
| Second V.F.O. Unit, Underside . . . . .                            | 8                   |
| 100 kc/s I.F. Strip, Right Side . . . . .                          | 9                   |
| 100 kc/s I.F. Strip, Left Side . . . . .                           | 10                  |
| B.F.O. Unit, Underside . . . . .                                   | 11                  |
| Crystal Calibrator Unit, Underside . . . . .                       | 12                  |

ILLUSTRATION 1



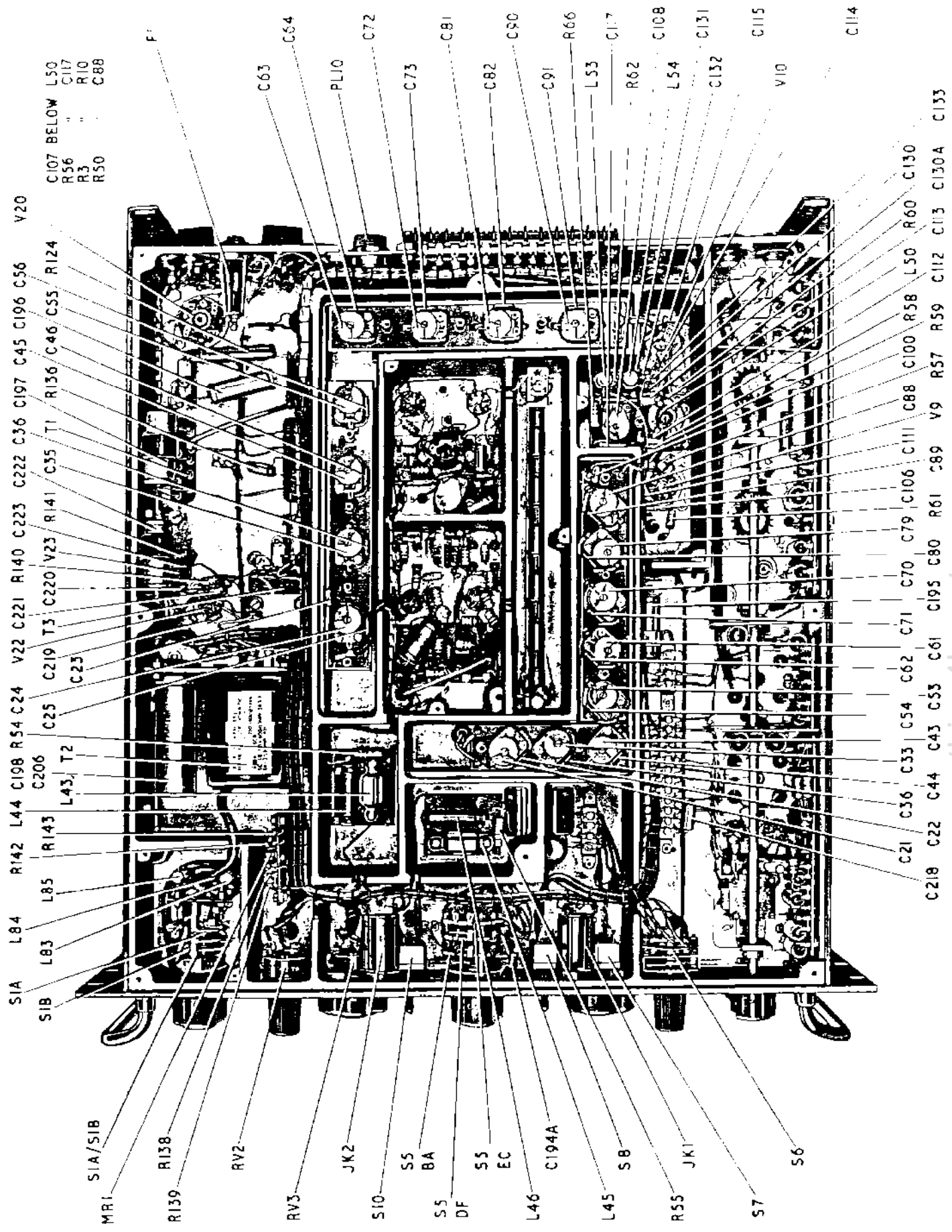
- 1 100kc/s IF
- 2 SECOND MIXER
- 3 4Mc/s, IF
- 4 HARMONIC FILTER
- 5 FIRST VFO SUPPLY FILTER
- 6 SYSTEM COMPARTMENT
- 7 CRYSTAL OSCILLATOR AND HARMONIC GENERATOR
- 8 HARMONIC MIXER AND 37.5Mc/s, AMPLIFIER
- 9 SUPPLY FILTER FOR 7 & 8
- 10 37.5Mc/s BAND PASS FILTER
- 11 POWER SUPPLIES
- 12 AUDIO STAGES
- 13 AERIAL ATTENUATOR

KEY TO UNDER-CHASSIS LAYOUT



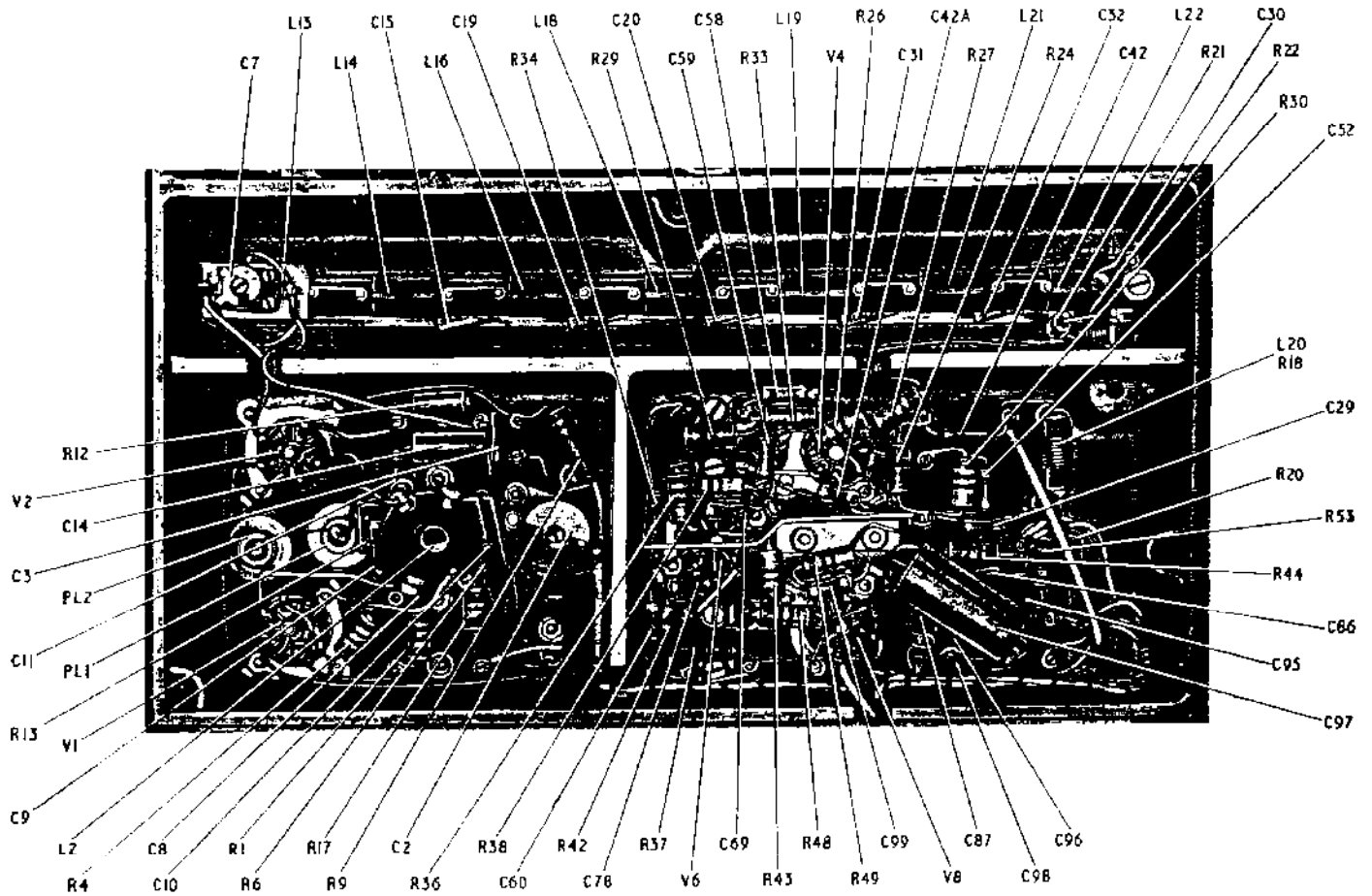
CHASSIS ASSEMBLY (TOP)





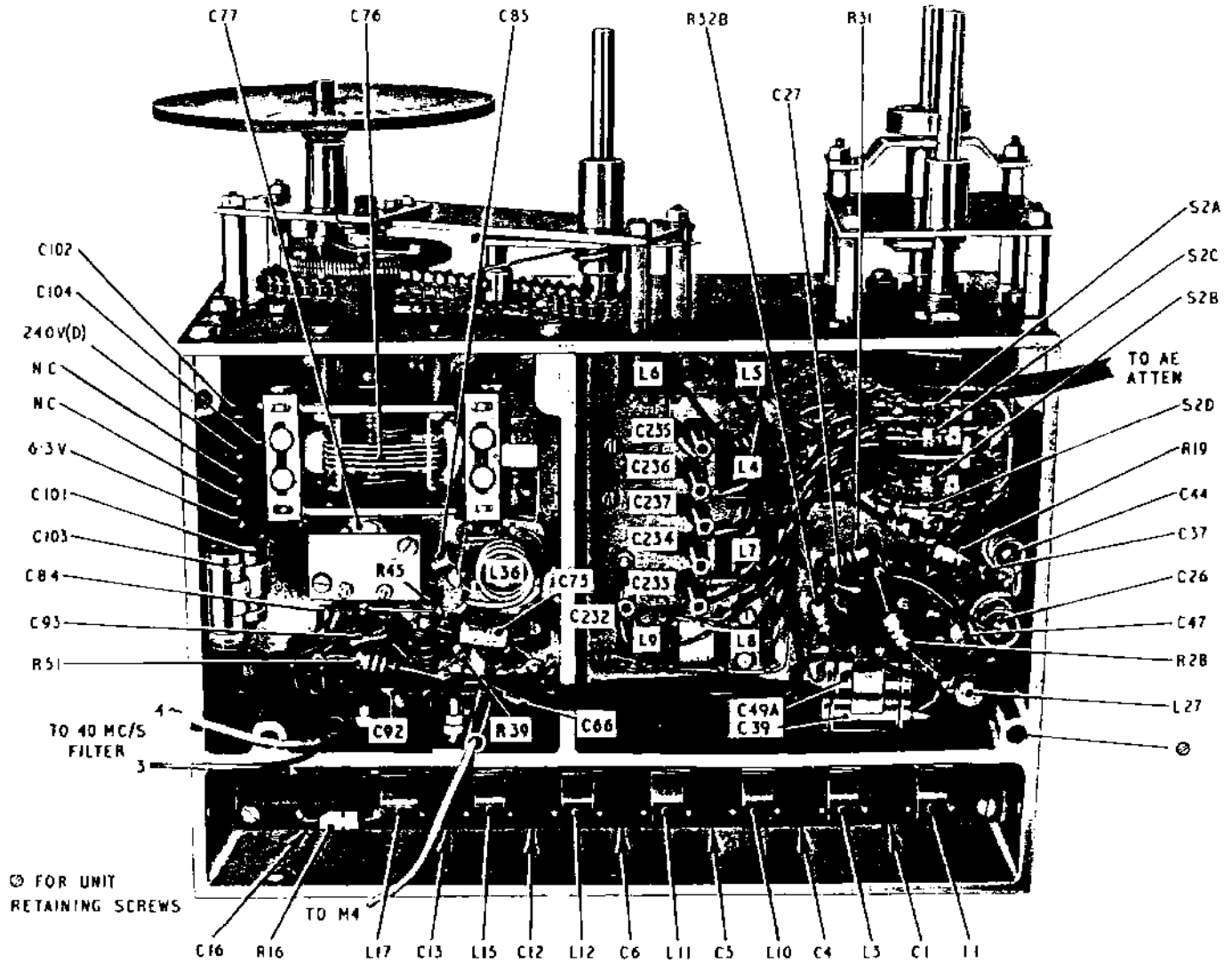
CHASSIS ASSEMBLY (UNDERSIDE)

ILLUSTRATION 4



CRYSTAL OSCILLATOR AND HARMONIC FILTER SYSTEM (UNDERSIDE)

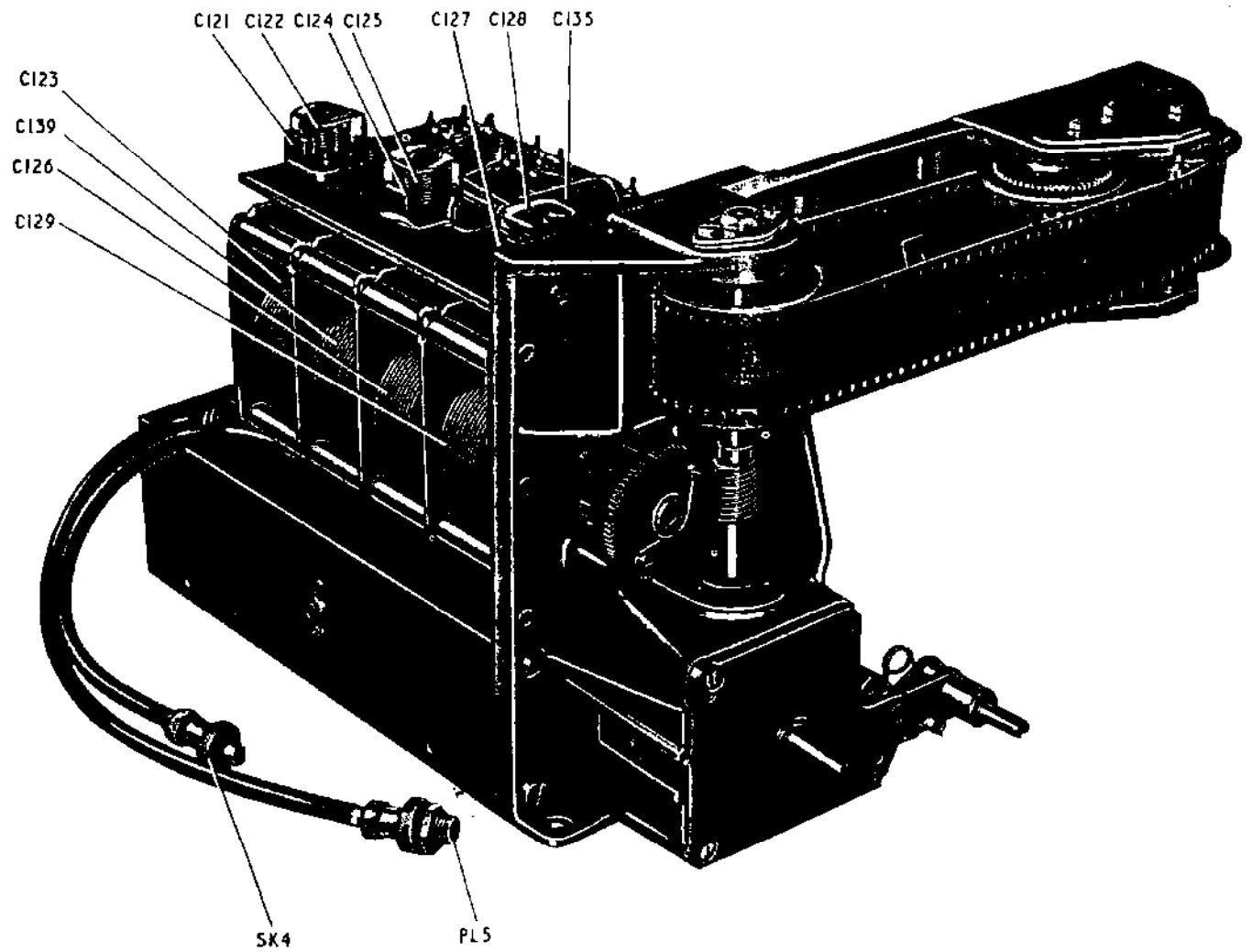
ILLUSTRATION 5



FIRST VFO UNIT (UNDERSIDE)

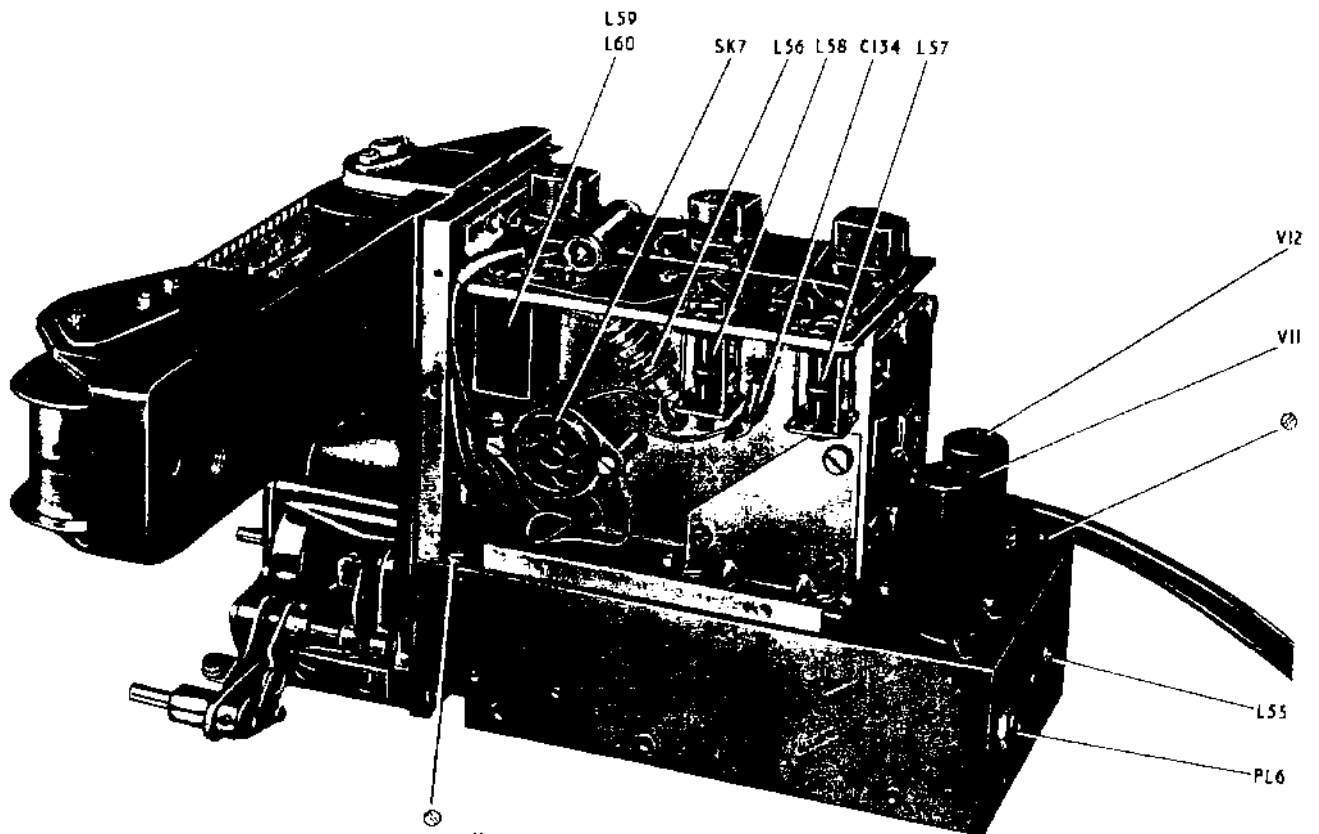
www.everything4lessstore.com

ILLUSTRATION 6



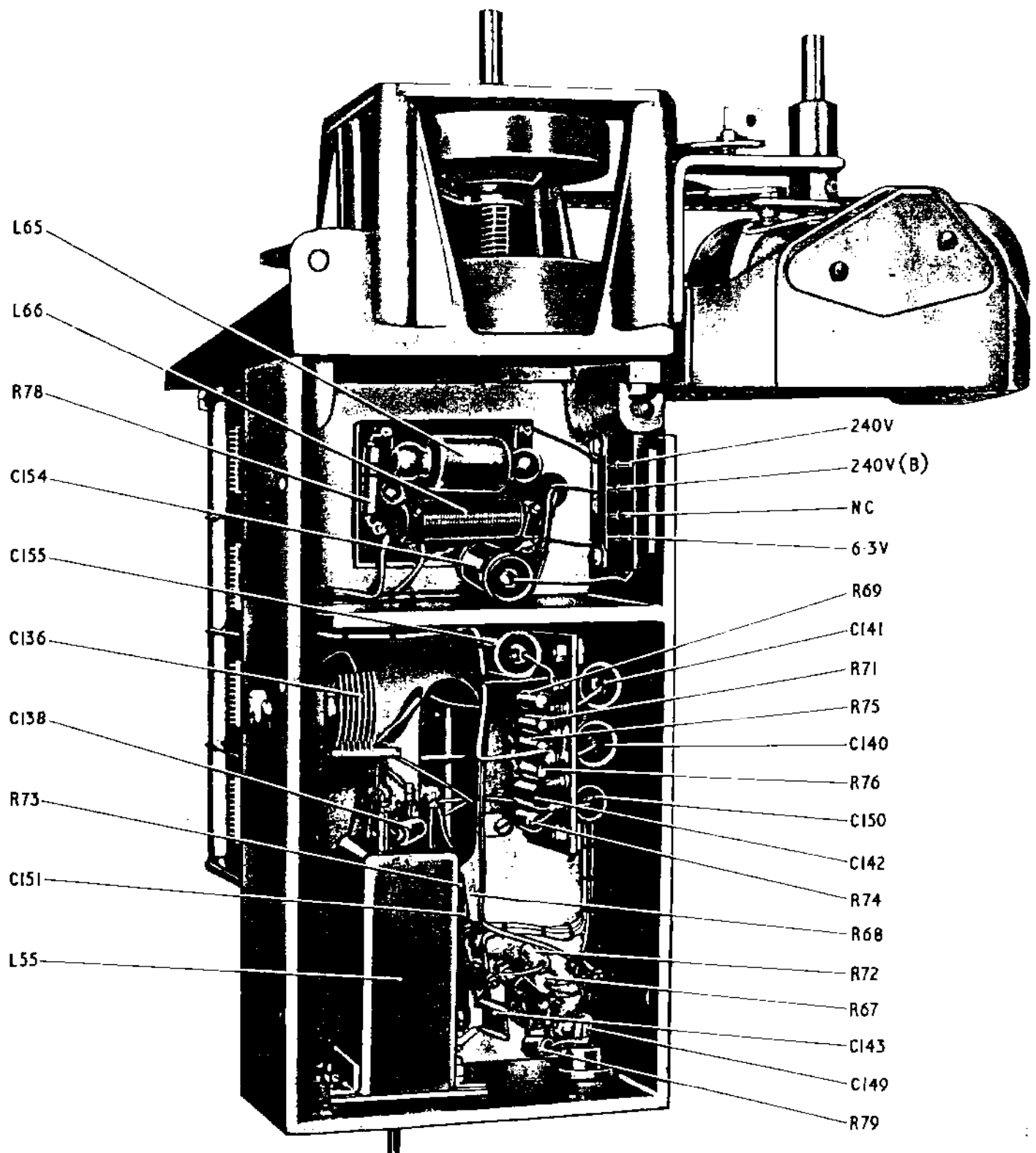
SECOND VFO UNIT (FRONT)

ILLUSTRATION 7

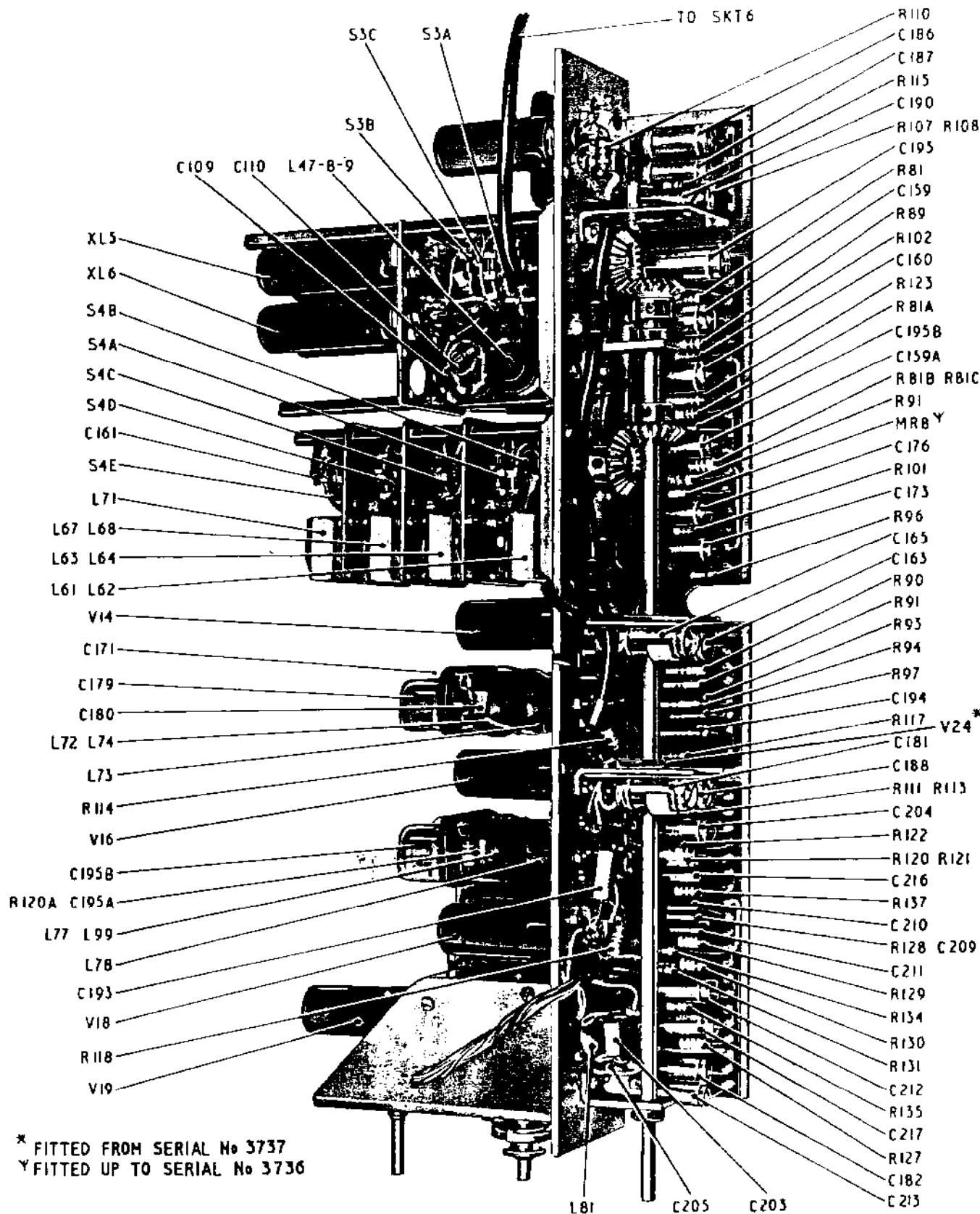


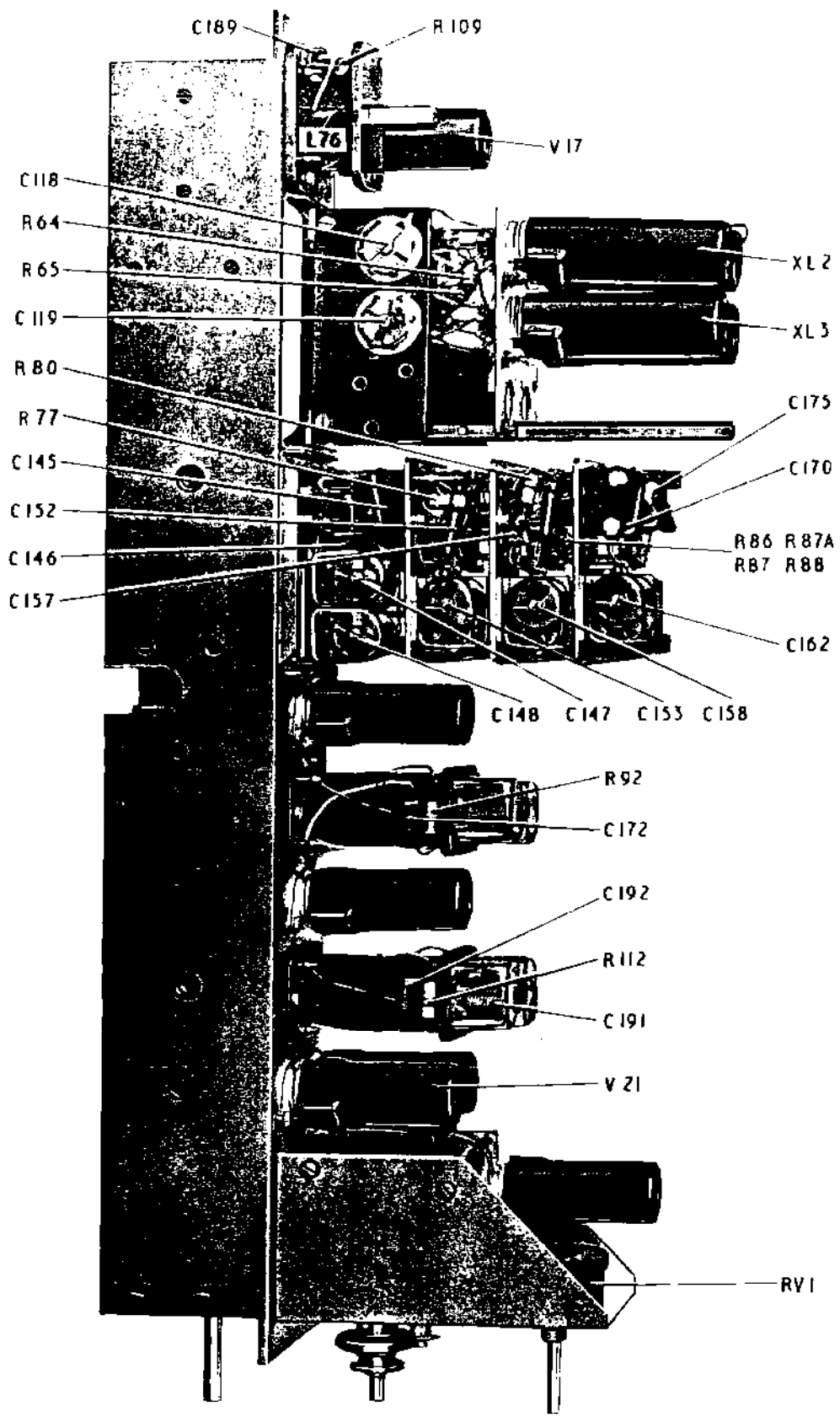
⊙ UNIT RETAINING SCREWS

SECOND VFO UNIT (REAR)



SECOND VFO UNIT (UNDERSIDE)





100 KC/S I.F. STRIP (LEFT SIDE)



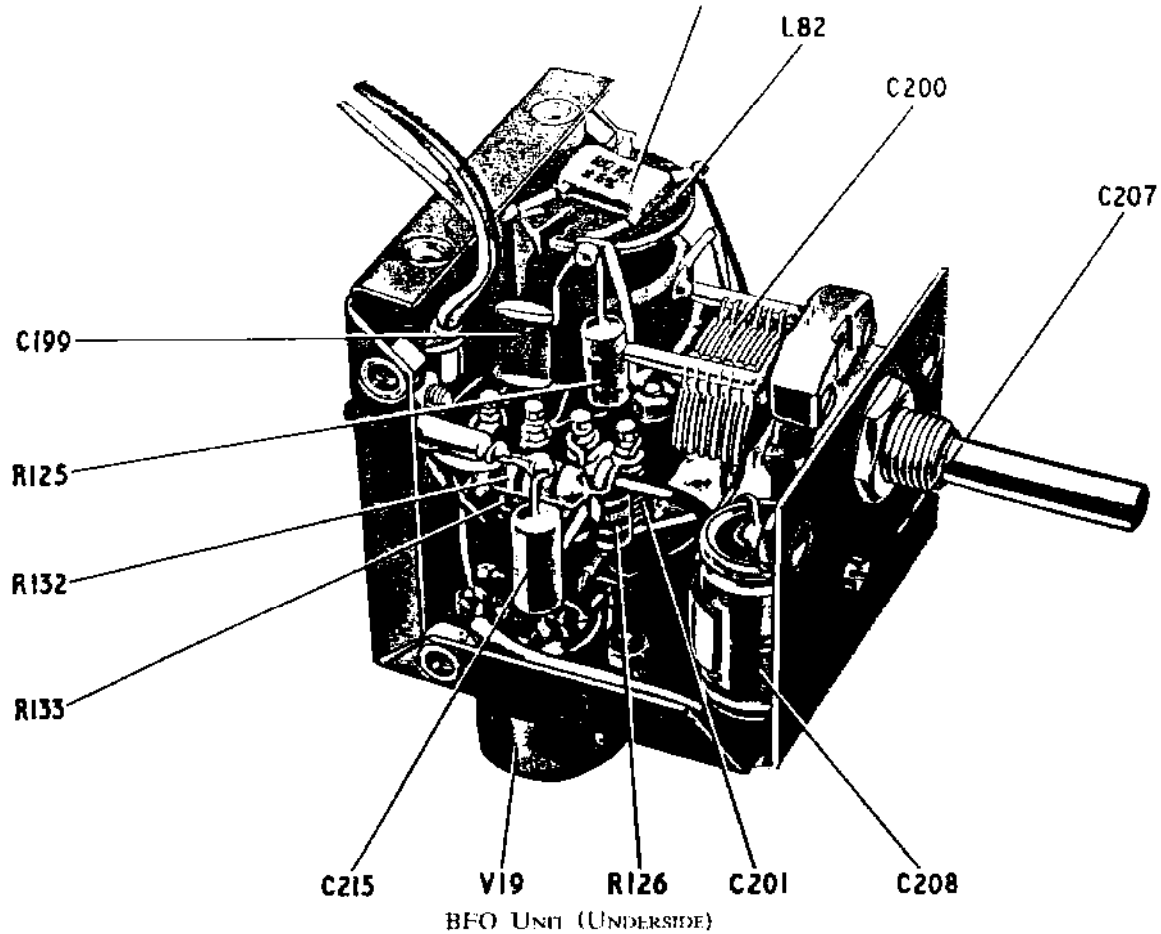
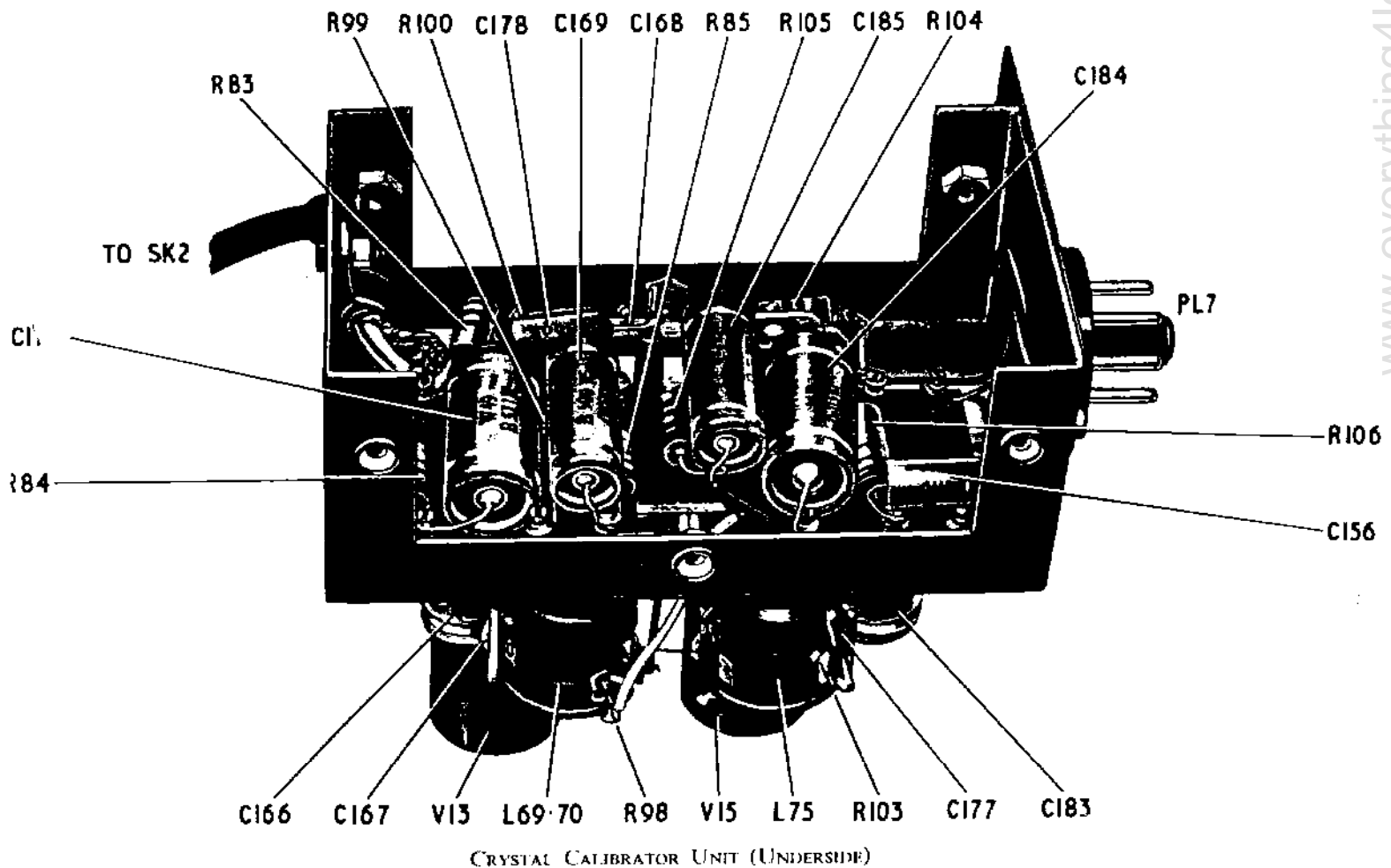


ILLUSTRATION 12



## SECTION 8

### LIST OF CIRCUIT COMPONENTS, SUPPLEMENTARY COMPONENTS, SUB-ASSEMBLIES AND SUB-UNITS

- 8.1 Resistors
- 8.2 Potentiometers
- 8.3 Capacitors
- 8.4 Switches
- 8.5 Plugs and Sockets
- 8.6 Valves (British)
- 8.7 Valves (American)
- 8.8 Valve and Crystal Holders
- 8.9 Inductances
- 8.10 Transformers
- 8.11 Rectifier
- 8.12 Loudspeakers
- 8.13 Meters
- 8.14 Crystals
- 8.15 Fuses and Fuseholders
- 8.16 Lamp and Holder
- 8.17 Voltage Selectors
- 8.18 Supplementary Components,  
and Sub-Assemblies
- 8.19 Main Sub-Units

**Joint-Service Numbers**

**(also known as CCA or NATO Stock Numbers)**

Commercial and private users will note that the above numbers have been included in this section ; these are for assisting Service users in the provisioning of spare components.

Note: It is recommended that users quote the Serial No. of the equipment on all orders for spare parts.

\* Indicates component used in RA.17L Receivers only.

† Indicates component used in RA.17C-12 Receivers only.

## 8.1 RESISTORS

| Cct. Ref.        | Value   | Description | Rating | Tol. | Joint Service No. | Manufacturer and Type or Drawing No. |
|------------------|---------|-------------|--------|------|-------------------|--------------------------------------|
| R1               | 100kΩ   | Carbon      | ½W     | 10%  | 5905-99-022-3037  | Erie 16                              |
| R2               | 100Ω    | Carbon      | ½W     | 10%  | 022-1109          | " 16                                 |
| R3               | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R4               | 100Ω    | Carbon      | ½W     | 10%  | 022-1109          | " 16                                 |
| R5               | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R6               | 4.7kΩ   | Carbon      | ½W     | 10%  | 022-2090          | " 8                                  |
| R7               | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R8               | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R9               | 10kΩ    | Carbon      | ½W     | 10%  | 022-2132          | " 8                                  |
| R10              | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R11              | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R12              | 100kΩ   | Carbon      | ½W     | 10%  | 022-3037          | " 16                                 |
| R13              | 22kΩ    | Carbon      | ½W     | 10%  | 022-2172          | " 16                                 |
| R14              | 150Ω    | Carbon      | ½W     | 10%  | 022-1130          | " 16                                 |
| R15              | 100Ω    | Carbon      | ½W     | 10%  | 022-1109          | " 16                                 |
| R15A             | 75Ω     | Carbon      | ½W     | 10%  | 022-3038          | " 9                                  |
| R16              | 680Ω    | Carbon      | ½W     | 10%  | 022-1214          | " 16                                 |
| R17              | 1kΩ     | Carbon      | ½W     | 10%  | 022-2006          | " 8                                  |
| R18              | 470Ω    | Carbon      | ½W     | 10%  | 022-1195          | " 8                                  |
| (Assy. with L20) |         |             |        |      |                   |                                      |
| R19              | 270kΩ   | Carbon      | ½W     | 10%  | 022-3091          | " 16                                 |
| R20              | 1kΩ     | Carbon      | ½W     | 10%  | 022-2004          | " 16                                 |
| R21              | 330Ω    | Carbon      | ½W     | 10%  | 022-1172          | " 16                                 |
| R22*             | 180Ω    | Carbon      | ½W     | 10%  | 022-1142          | " 16                                 |
| R22†             | 470Ω    | Carbon      | ½W     | 10%  | 022-1193          | " 16                                 |
| R23              | 82Ω     | Carbon      | ½W     | 10%  | 022-1100          | " 16                                 |
| R24              | 10kΩ    | Carbon      | ½W     | 10%  | 022-2130          | " 16                                 |
| R25              | 10Ω     | Carbon      | ½W     | 10%  | 022-1001          | " 16                                 |
| R26              | 10Ω     | Carbon      | ½W     | 10%  | 022-1001          | " 16                                 |
| R27              | 10Ω     | Carbon      | ½W     | 10%  | 022-1001          | " 16                                 |
| R28              | 680Ω    | Carbon      | ½W     | 10%  | 022-1214          | " 16                                 |
| R29*             | 1kΩ     | Carbon      | ½W     | 10%  | 022-2004          | " 16                                 |
| R29†             | 4.7kΩ   | Carbon      | ½W     | 10%  | 022-2088          | " 16                                 |
| R30              | 220Ω    | Carbon      | ½W     | 10%  | 022-1151          | " 16                                 |
| R31              | 470Ω    | Carbon      | ½W     | 10%  | 022-1193          | " 16                                 |
| R32              | 100kΩ   | Carbon      | ½W     | 10%  | 022-3037          | " 16                                 |
| R32A             | 100kΩ   | Carbon      | ½W     | 10%  | 022-3037          | " 16                                 |
| R32B             | 10kΩ    | Carbon      | ½W     | 10%  | 022-2130          | " 16                                 |
| R33              | 10kΩ    | Carbon      | ½W     | 10%  | 022-2130          | " 16                                 |
| R34              | 470kΩ   | Carbon      | ½W     | 10%  | 022-3121          | " 16                                 |
| R35              | DELETED |             |        |      |                   |                                      |
| R36              | 10Ω     | Carbon      | ½W     | 10%  | 022-1001          | " 16                                 |
| R37              | 1kΩ     | Carbon      | ½W     | 10%  | 022-2004          | " 16                                 |
| R38*             | 220Ω    | Carbon      | ½W     | 10%  | 022-1151          | " 16                                 |
| R38†             | 120Ω    | Carbon      | ½W     | 10%  | 022-1121          | " 16                                 |
| R39*             | 1kΩ     | Carbon      | ½W     | 10%  | 022-2004          | " 16                                 |
| R39†             | 18kΩ    | Carbon      | ½W     | 10%  | 022-2163          | " 16                                 |
| R40              | 10Ω     | Carbon      | ½W     | 10%  | 022-1001          | " 16                                 |
| R41*             | 47kΩ    | Carbon      | ½W     | 10%  | 022-2214          | " 16                                 |
| R41†             | 10kΩ    | Carbon      | ½W     | 10%  | 022-2130          | " 16                                 |
| R42              | 47kΩ    | Carbon      | ½W     | 10%  | 022-2214          | " 16                                 |
| R43*             | 2.2kΩ   | Carbon      | ½W     | 10%  | 022-2046          | " 16                                 |
| R43†             | 470kΩ   | Carbon      | ½W     | 10%  | 022-3121          | " 16                                 |

## 8.1 RESISTORS (continued)

| <i>Cct.<br/>Ref.</i>         | <i>Value</i> | <i>Description</i> | <i>Rating</i> | <i>Tol.</i> | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |      |
|------------------------------|--------------|--------------------|---------------|-------------|--------------------------|---|------|
| R44*                         | 10kΩ         | Carbon             | 1/4W          | 10%         | 5905-99-022-2130         | Erie  | 16   |
| R44†                         | 47kΩ         | Carbon             | 1/4W          | 10%         | 022-2214                 | "   | 16   |
| R45                          | 10Ω          | Carbon             | 1/4W          | 10%         | 022-1001                 | "   | 16   |
| R46                          | 100kΩ        | Carbon             | 1/4W          | 10%         | 022-3037                 | "   | 16   |
| R47                          | 56Ω          | Carbon             | 1/4W          | 10%         | 022-1079                 | "   | 16   |
| R48                          | 10Ω          | Carbon             | 1/4W          | 10%         | 022-1001                 | "   | 16   |
| R49*                         | 220Ω         | Carbon             | 1/4W          | 10%         | 022-1151                 | "   | 16   |
| R49†                         | 120Ω         | Carbon             | 1/4W          | 10%         | 022-1121                 | "   | 16   |
| R50                          | 2·2kΩ        | Carbon             | 1/4W          | 10%         | 022-2046                 | "   | 16   |
| R51                          | 1kΩ          | Carbon             | 1/4W          | 10%         | 022-2004                 | "   | 16   |
| R52                          | 15kΩ         | Carbon             | 1/4W          | 10%         | 022-2151                 | "   | 16   |
| R53                          | 470Ω         | Carbon             | 1/4W          | 10%         | 022-1193                 | "   | 16   |
| R54                          | 100Ω         | Carbon             | 1/4W          | 10%         | 022-1111                 | "   | 8    |
| R55                          | 1kΩ          | Carbon             | 1/4W          | 10%         | 022-2006                 | "   | 8    |
| R56                          | 15kΩ         | Carbon             | 1/4W          | 10%         | 022-2151                 | "   | 16   |
| R57                          | 10Ω          | Carbon             | 1/4W          | 10%         | 022-1001                 | "   | 16   |
| R58                          | 470kΩ        | Carbon             | 1/4W          | 10%         | 022-3121                 | "   | 16   |
| R59                          | 56Ω          | Carbon             | 1/4W          | 10%         | 022-1079                 | "   | 16   |
| R60*                         | 220Ω         | Carbon             | 1/4W          | 10%         | 022-1151                 | "   | 16   |
| R60†                         | 120Ω         | Carbon             | 1/4W          | 10%         | 022-1121                 | "   | 16   |
| R61                          | 470Ω         | Carbon             | 1/4W          | 10%         | 022-1193                 | "   | 16   |
| R62*                         | 10kΩ         | Carbon             | 1/4W          | 10%         | 022-2130                 | "   | 16   |
| R62†                         | 47kΩ         | Carbon             | 1/4W          | 10%         | 022-2214                 | "   | 16   |
| R63                          | DELETED      |                    |               |             |                          |   |      |
| R64                          | 330kΩ        | Carbon             | 1/4W          | 10%         | 022-3100                 | "   | 16   |
| R65                          | 100kΩ        | Carbon             | 1/4W          | 10%         | 022-3037                 | "   | 16   |
| R66                          | 1kΩ          | Carbon             | 1/4W          | 10%         | 022-2006                 | "   | 8    |
| R67                          | 470Ω         | Carbon             | 1/4W          | 10%         | 022-1193                 | "   | 16   |
| R68                          | 22kΩ         | Carbon             | 1/4W          | 10%         | 022-2172                 | "   | 16   |
| R69                          | 18kΩ         | Carbon             | 1/4W          | 10%         | 022-2165                 | "   | 8    |
| R70*                         | 470kΩ        | Carbon             | 1/4W          | 10%         | 022-3121                 | "   | 16   |
| R70†                         | 82kΩ         | Carbon             | 1/4W          | 10%         | 022-3028                 | "   | 16   |
| R71                          | 12kΩ         | Wirewound          | 3W            | 5%          | 011-3346                 | Painton   | P306 |
| R72                          | 470Ω         | Carbon             | 1/4W          | 10%         | 022-1193                 | Erie  | 16   |
| R73                          | 470Ω         | Carbon             | 1/4W          | 10%         | 022-1193                 | "   | 16   |
| R74                          | 150Ω         | Carbon             | 1/4W          | 10%         | 022-1130                 | "   | 16   |
| R75                          | 8·2kΩ        | Carbon             | 1/4W          | 10%         | 022-2123                 | "   | 8    |
| R76*                         | 33kΩ         | Carbon             | 1/4W          | 10%         | 022-2195                 | "   | 8    |
| (Fitted up to Ser. No. 3736) |              |                    |               |             |                          |   |      |
| R76†                         | DELETED      |                    |               |             |                          |   |      |
| R76A*                        | 82kΩ         | Carbon             | 1/4W          | 10%         | 022-3028                 | "   | 16   |
| R76A†                        | 47kΩ         | Carbon             | 1/4W          | 10%         | 022-2214                 | "   | 16   |
| R77                          | 470Ω         | Carbon             | 1/4W          | 10%         | 022-1193                 | "   | 16   |
| R78                          | 1kΩ          | Carbon             | 1/4W          | 10%         | 022-2006                 | "   | 8    |
| R79                          | 2·2kΩ        | Carbon             | 1/4W          | 10%         | 022-2047                 | "   | 8    |
| R80                          | 470kΩ        | Carbon             | 1/4W          | 10%         | 022-3121                 | "   | 16   |
| R81                          | 2·2kΩ        | Carbon             | 1/4W          | 10%         | 022-2048                 | "   | 8    |
| R81A                         | 1·5kΩ        | Carbon             | 1/4W          | 10%         | 022-2025                 | "   | 16   |
| R81B                         | 10mΩ         | Carbon             | 1/4W          | 10%         | 022-3289                 | "   | 16   |
| R81C                         | 10mΩ         | Carbon             | 1/4W          | 10%         | 022-3289                 | "   | 16   |
| R82                          | DELETED      |                    |               |             |                          |   |      |
| R83                          | 4·7kΩ        | Carbon             | 1/4W          | 10%         | 022-2088                 | "   | 16   |
| R84                          | 1MΩ          | Carbon             | 1/4W          | 10%         | 022-3163                 | "   | 16   |
| R85                          | 220Ω         | Carbon             | 1/4W          | 10%         | 022-1151                 | "   | 16   |
| R86                          | 22Ω          | Carbon             | 1/4W          | 10%         | 022-1025                 | "   | 16   |
| R87                          | 120Ω         | Carbon             | 1/4W          | 10%         | 022-1121                 | "   | 16   |
| R87A                         | 68Ω          | Carbon             | 1/4W          | 10%         | 022-1088                 | "   | 16   |
| R88                          | 330Ω         | Carbon             | 1/4W          | 10%         | 022-1172                 | "   | 16   |
| R89                          | 2·2kΩ        | Carbon             | 1/4W          | 10%         | 022-2048                 | "   | 8    |

# 8.1 RESISTORS (continued)

| Cct.<br>Ref.                | Value         | Description | Rating          | Tol.      | Joint Service No. | Manufacturer and<br>Type or Drawing No. |         |
|-----------------------------|---------------|-------------|-----------------|-----------|-------------------|---|---------|
| R90                         | 4.7k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 5905-99-022-2090  | Erie                                    | 8       |
| R91                         | 4.7k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2090          | "                                       | 8       |
| R91A                        | 470k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3121          | "                                       | 16      |
| R92                         | 270k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3091          | "                                       | 16      |
| R93                         | 33k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2195          | "                                       | 8       |
| R94                         | 27k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2186          | "                                       | 8       |
| R95                         | 100 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1109          | "                                       | 16      |
| R96                         | 470k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3121          | "                                       | 16      |
| R97                         | 15k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2153          | "                                       | 8       |
| R97A*                       | 39k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2205          | "                                       | 16      |
| (Fitted from Ser. No. 3737) |               |             |                 |           |                   |   |         |
| R97A†                       | 39k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2205          | "                                       | 16      |
| R98                         | 2.2k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2046          | "                                       | 16      |
| R99                         | 22k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2172          | "                                       | 16      |
| R100                        | 22k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2172          | "                                       | 16      |
| R101                        | 120 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1121          | "                                       | 16      |
| R102                        | 82k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3028          | "                                       | 16      |
| R103                        | 2.2k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2046          | "                                       | 16      |
| R104                        | 1M $\Omega$   | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3163          | "                                       | 16      |
| R105                        | 1k $\Omega$   | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2004          | "                                       | 16      |
| R106                        | 68k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3018          | "                                       | 8       |
| R107                        | 2.2k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2048          | "                                       | 8       |
| R108                        | 33k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2195          | "                                       | 8       |
| R109                        | 4.7k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2090          | "                                       | 8       |
| R110                        | 100 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1109          | "                                       | 16      |
| R111                        | 2.2k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2048          | "                                       | 8       |
| R112                        | 47k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2214          | "                                       | 16      |
| R113                        | 33k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2195          | "                                       | 8       |
| R114                        | 100 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1109          | "                                       | 16      |
| R115                        | 150 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1130          | "                                       | 16      |
| R116                        | 470k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3121          | "                                       | 16      |
| R116A†                      | 5.6k $\Omega$ | Carbon      | $\frac{1}{2}$ W | $\pm 1\%$ |                   | Dubilier                                | R411    |
| R117                        | 150 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1130          | Erie                                    | 16      |
| R118                        | 2.2M $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3205          | "                                       | 16      |
| R119                        | 470k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3121          | "                                       | 16      |
| R119A                       | 10k $\Omega$  | Wirewound   | 10W             | 5%        | 011-3088          | Zenith                                  | TG214   |
| R120                        | 100k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3039          | Erie                                    | 8       |
| R120A                       | 27k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2184          | "                                       | 16      |
| R121                        | 100k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3039          | "                                       | 8       |
| R122                        | 6.8k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2109          | "                                       | 16      |
| R123                        | 82k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3030          | "                                       | 16      |
| R124                        | 165 $\Omega$  | Wirewound   | 10W             | 5%        | 972-8311          | "                                       | Style X |
| R125                        | 47k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2214          | "                                       | 16      |
| R126                        | 100 $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-1109          | "                                       | 16      |
| R127                        | 82k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3028          | "                                       | 16      |
| R128                        | 18k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2163          | "                                       | 16      |
| R129                        | 18k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2163          | "                                       | 16      |
| R130                        | 82k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3028          | "                                       | 16      |
| R131                        | 4.7k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2088          | "                                       | 16      |
| R132                        | 1k $\Omega$   | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2004          | "                                       | 16      |
| R133                        | 4.7k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2090          | "                                       | 8       |
| R133A†                      | 27k $\Omega$  | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2184          | "                                       | 16      |
| R134                        | 1M $\Omega$   | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3163          | "                                       | 16      |
| R135                        | 1.2M $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3175          | "                                       | 16      |
| R135A†                      | 100k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3037          | "                                       | 16      |
| R136                        | 47 $\Omega$   | Wirewound   | 3W              | 5%        | 011-3288          | Welwyn                                  | AW3115  |
| R136A                       | 8.2k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-2123          | Erie                                    | 8       |
| R137                        | 1.5M $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3184          | "                                       | 16      |
| R137A*                      | 100k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3037          | "                                       | 16      |
| R137B*                      | 100k $\Omega$ | Carbon      | $\frac{1}{2}$ W | 10%       | 022-3037          | "                                       | 16      |

## 8.1 RESISTORS (continued)

| <i>Cct.<br/>Ref.</i> | <i>Value</i> | <i>Description</i> | <i>Rating</i>   | <i>Tol.</i> | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |       |
|----------------------|--------------|--------------------|-----------------|-------------|--------------------------|---|-------|
| R138                 | 120Ω         | Carbon             | $\frac{1}{8}$ W | 5%          | 5905-99-                 | Erie  | 109   |
| R138A†               | 100kΩ        | Carbon             | $\frac{1}{8}$ W | 10%         | 022-3039                 | "   | 8     |
| R138B†               | 1.5kΩ        | Carbon             | 3W              | 5%          |                          | Painton   | P.306 |
| R139                 | 120Ω         | Carbon             | $\frac{1}{8}$ W | 5%          |                          | Erie  | 109   |
| R139A†               | 470kΩ        | Carbon             | $\frac{1}{8}$ W | 10%         | 022-3121                 | "   | 16    |
| R140*                | 220Ω         | Carbon             | $\frac{1}{8}$ W | 10%         | 022-1151                 | "   | 16    |
| R140†                | 270Ω         | Carbon             | $\frac{1}{8}$ W | 10%         |                          | "   | 8     |
| R140A†               | 4.7kΩ        | Carbon             | $\frac{1}{8}$ W | 10%         | 022-2088                 | "   | 16    |
| R140B†               | 2.2kΩ        | Carbon             | $\frac{1}{8}$ W | 10%         | 022-2046                 | "   | 16    |
| R141*                | 220Ω         | Carbon             | $\frac{1}{8}$ W | 10%         | 022-1151                 | "   | 16    |
| R141†                | 680Ω         | Carbon             | $\frac{1}{8}$ W | 10%         | 022-1214                 | "   | 16    |
| R142                 | 1.2kΩ        | Carbon             | $\frac{1}{8}$ W | 5%          |                          | "   | 109   |
| R143                 | 1.2kΩ        | Carbon             | $\frac{1}{8}$ W | 5%          |                          | "   | 109   |
| R144*                | 10Ω          | Carbon             | $\frac{1}{8}$ W | 10%         | 022-1001                 | "   | 16    |
| R144†                | DELETED      |                    |                 |             |                          |   |       |
| R144A†               | 10Ω          | Carbon             | $\frac{1}{8}$ W | 10%         | 022-1001                 | "   | 16    |
| R145                 | 56kΩ         | Carbon             | $\frac{1}{8}$ W | 10%         | 022-3007                 | "   | 16    |

## 8.2 POTENTIOMETERS

|      |     |  |  |  |                  |                        |             |
|------|-----|--|--|--|------------------|------------------------|-------------|
| RV1  | 1kΩ | Wirewound  |  |  | 5905-99-972-8314 | Colvern                | CLR3001/21  |
| RV2  | 2MΩ | Composition<br>log/law 1"<br>spindle                       |  |  | 940-9134         | AB Metals<br>Clarostat | 37          |
| RV3  | 2MΩ | Composition<br>log/law $\frac{1}{2}$ "<br>spindle, slotted |  |  | 940-9135         | AB Metals<br>Clarostat | 37          |
| RV4† | 1kΩ | Wirewound  |  |  |                  | Colvern                | CLR1189/15S |

## 8.3 CAPACITORS

|      |          |                               |       |          |                  |                      |            |
|------|----------|-------------------------------|-------|----------|------------------|----------------------|------------|
| C1   | 2.7pF    | Ceramic                       | 750V  | 10%      | 5910-99-911-8271 | Erie                 | P100K      |
| C2   | 33pF     | Trimmer                       |       |          | 016-0047         | Wingrove<br>& Rogers | C31-01/1   |
| C3   | 220pF    | Silver/Mica                   | 350V  | 5%       | 911-6954         | Lemco                | 1106S      |
| C4   | 14.7pF   | Ceramic                       | 750V  | 10%      | 011-8301         | Erie                 | N750K      |
| C5   | 14.7pF   | Ceramic                       | 750V  | 10%      | 011-8301         | "                    | N750K      |
| C6   | 14.7pF   | Ceramic                       | 750V  | 10%      | 011-8301         | "                    | N750K      |
| C7*  | 10pF     | Trimmer                       |       |          | 911-4011         | Wingrove<br>& Rogers | C32-01     |
| C7†  |          | Piece of twisted wire         |       |          |                  |                      |            |
| C8   | 10pF     | Ceramic                       | 750V  | 5%       | 013-2425         | Erie                 | P100K      |
| C9   | 100pF    | Silver/Mica                   | 350V  | 5%       | 911-6953         | Lemco                | 1106S      |
| C10  | 0.01μF   | Paper                         | 500V  | 20%      | 012-0123         | Hunt                 | W97/BM21KV |
| C11  | 0.005μF  | Paper                         | 400V  | 20%      | 011-5824         | "                    | W97/BM20Z  |
| C12  | 14.7pF   | Ceramic                       | 750V  | 10%      | 011-8301         | Erie                 | N750K      |
| C13  | 14.7pF   | Ceramic                       | 750V  | 20%      | 011-8301         | "                    | N750K      |
| C14  | 0.01μF   | Paper                         | 500V  | 20%      | 012-0123         | Hunt                 | W97/BM21KV |
| C15  | 10pF     | Ceramic                       | 750V  | 5%       | 013-2425         | Erie                 | P100K      |
| C16  | 0.01μF   | Paper                         | 500V  | 20%      | 012-0123         | Hunt                 | W97/BM21KV |
| C17  | 0.001μF  | Ceramic                       | 350V  | +80%—20% |                  | Erie                 | K350081/AD |
| C18A | 212pF    | Variable (2 gang)             |       |          |                  | Racal                | AD15451    |
| C18B | See C18A |                               |       |          |                  |                      |            |
| C18C | 6.8pF    | Ceramic                       | 750V  | 5%       |                  | Erie                 | P100K      |
| C19  | 10pF     | Ceramic                       | 750V  | 5%       | 011-2425         | "                    | P100K      |
| C20  | 10pF     | Ceramic                       | 750V  | 5%       | 011-2425         | "                    | P100K      |
| C21  | 18pF     | Trimmer, with<br>acetate case | 1000V |          | 972-8322         | Oxley                | A15/13.2   |
| C22  | 33pF     | Silver/Mica                   | 350V  | 5%       | 911-4291         | Lemco                | 1106S      |
| C23  | 0.001μF  | Ceramic                       | 350V  | +80%—20% |                  | Erie                 | K350081/AD |

### 8.3 CAPACITORS (continued)

| Cct. Ref. | Value   | Description                | Rating | Tol.     | Joint Service No. | Manufacturer and Type or Drawing No. |            |
|-----------|---------|----------------------------|--------|----------|-------------------|--------------------------------------|------------|
| C24       | 18pF    | Trimmer, with acetate case | 1000V  |          | 5910-99-972-8322  | Oxley                                | A15/13.2   |
| C25       | 22pF    | Silver/Mica                | 350V   | 5%       | 911-4294          | Lemco                                | 1106S      |
| C26       | 0.05μF  | Paper                      | 350V   | 25%      | 011-5559          | Hunt                                 | W49/B511K  |
| C27       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C28       | 220pF   | Silver/Mica                | 350V   | 10%      | 940-9085          | Lemco                                | 1106S      |
| C29       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C30       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C31       | 10pF    | Ceramic                    | 750V   | 5%       | 013-2425          | "                                    | P100K      |
| C32       | 10pF    | Ceramic                    | 750V   | 5%       | 013-2425          | "                                    | P100K      |
| C33       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C34       | 39pF    | Silver/Mica                | 350V   | 5%       | 911-6837          | Lemco                                | 1106S      |
| C35       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C36       | 33pF    | Silver/Mica                | 350V   | 5%       | 911-4291          | Lemco                                | 1106S      |
| C37       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C38       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C39       | 0.1μF   | Paper                      | 150V   | 25%      | 011-5560          | Hunt                                 | W49/B500KY |
| C40       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C41       | 0.1μF   | Paper                      | 150V   | 25%      | 011-5560          | Hunt                                 | W49/B500KY |
| C42       | 220pF   | Silver/Mica                | 350V   | 5%       | 911-6954          | Lemco                                | 1106S      |
| C42A      | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C43       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C44       | 39pF    | Silver/Mica                | 350V   | 5%       | 911-6837          | Lemco                                | 1106S      |
| C45       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C46       | 33pF    | Silver/Mica                | 350V   | 5%       | 911-4291          | Lemco                                | 1106S      |
| C47       | 8.2pF   | Ceramic                    | 750V   | 10%      | 013-2424          | Erie                                 | P100K      |
| C48       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C49       | 0.01μF  | Paper                      | 500V   | 20%      | 012-0123          | Hunt                                 | W97/BM21KV |
| C49A      | 0.05μF  | Paper                      | 350V   | 25%      | 011-5559          | "                                    | W49/B511K  |
| C50       | 82pF    | Silver/Mica                | 350V   | 5%       | 911-6952          | Lemco                                | 1106S      |
| C51       | 220pF   | Silver/Mica                | 350V   | 5%       | 911-6954          | "                                    | 1106S      |
| C52       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C53       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C54       | 39pF    | Silver/Mica                | 350V   | 5%       | 911-6837          | Lemco                                | 1106S      |
| C55       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C56       | 33pF    | Silver/Mica                | 350V   | 5%       | 911-4291          | Lemco                                | 1106S      |
| C57       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C58       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C59       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C60       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C61       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C62       | 39pF    | Silver/Mica                | 350V   | 5%       | 911-6837          | Lemco                                | 1106S      |
| C63       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C64       | 33pF    | Silver/Mica                | 350V   | 5%       | 911-4291          | Lemco                                | 1106S      |
| C65       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C66       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C67       | 82pF    | Silver/Mica                | 350V   | 5%       | 911-6952          | Lemco                                | 1106S      |
| C68       | 220pF   | Silver/Mica                | 350V   | 5%       | 911-6954          | "                                    | 1106S      |
| C69       | 0.001μF | Ceramic                    | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C70       | 18pF    | Trimmer, with acetate case | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |



### 8.3 CAPACITORS (continued)

| Cct. Ref. | Value   | Description                  | Rating | Tol.     | Joint Service No. | Manufacturer and Type or Drawing No. |            |
|-----------|---------|------------------------------|--------|----------|-------------------|--------------------------------------|------------|
| C71       | 39pF    | Silver/Mica                  | 350V   | 5%       | 5910-99-911-6837  | Lemco                                | 1106S      |
| C72       | 18pF    | Trimmer, with acetate case   | 1000V  |          | 972-8322          | Oxley                                | A15/13.2   |
| C73       | 33pF    | Silver/Mica                  | 350V   | 5%       | 911-4291          | Lemco                                | 1106S      |
| C74       | 220pF   | Silver/Mica                  | 350V   | 10%      | 940-9085          | "                                    | 1106S      |
| C75*      | 47pF    | Ceramic                      | 750V   | 5%       | 013-2288          | Erie                                 | N750K      |
| C75†      | 220pF   | Silver/Mica                  | 350V   | 10%      | 940-9085          | Lemco                                | 1106S      |
| C76       | 100pF   | Variable                     |        |          |                   | Wingrove & Rogers                    | C1601      |
| C77       | 33pF    | Trimmer                      |        |          | 016-0047          | Wingrove & Rogers                    | 10/012SLF  |
| C78       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | C31-01/1   |
| C79       | 18pF    | Trimmer, with acetate case   | 1000V  |          | 972-8322          | Oxley                                | K350081/AD |
| C80       | 39pF    | Silver/Mica                  | 350V   | 5%       | 911-6837          | Lemco                                | A15/13.2   |
| C81       | 18pF    | Trimmer, with acetate case   | 1000V  |          | 972-8322          | Oxley                                | 1106S      |
| C82       | 33pF    | Silver/Mica                  | 350V   | 5%       | 911-4291          | Lemco                                | A15/13.2   |
| C83       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | 1106S      |
| C84       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C85       | 3.3pF   | Ceramic                      | 750V   | 10%      | 013-2419          | "                                    | K350081/AD |
| C86       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | P100K      |
| C87       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C88       | 18pF    | Trimmer, with acetate case   | 1000V  |          | 972-8322          | Oxley                                | K350081/AD |
| C89       | 33pF    | Silver/Mica                  | 350V   | 5%       | 911-4291          | Lemco                                | A15/13.2   |
| C90       | 18pF    | Trimmer, with acetate case   | 1000V  |          | 972-8322          | Oxley                                | 1106S      |
| C91       | 15pF    | Silver/Mica                  | 350V   | ±1pF     | 911-6850          | Lemco                                | A15/13.2   |
| C92       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | 1106S      |
| C93       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C94       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C95       | 0.01μF  | Paper                        | 500V   | 20%      | 012-0123          | Hunt                                 | W97/BM21KV |
| C95A      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C96       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C97       | 0.25μF  | Paper                        | 150V   | 25%      | 011-5563          | Hunt                                 | W49/B501   |
| C98       | 0.01μF  | Paper                        | 500V   | 20%      | 012-0123          | "                                    | W97/BM21KV |
| C98A      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C99       | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | "                                    | K350081/AD |
| C100      | 0.001μF | Ceramic                      | 350V   | +80%—20% | 914-9000          | "                                    | K3500/AD   |
| C101      | 0.05μF  | Paper                        | 350V   | 25%      | 011-5559          | Hunt                                 | W49/B511KZ |
| C102      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C103      | 0.1μF   | Paper                        | 150V   | 25%      | 011-5560          | Hunt                                 | W49/B500KY |
| C104      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C105      | 0.01μF  | Paper                        | 500V   | 20%      | 012-0123          | Hunt                                 | W97/BM21KV |
| C106      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C107      | 220pF   | Silver/Mica                  | 350V   | 10%      | 940-9085          | Lemco                                | 1106S      |
| C108      | 33pF    | Trimmer                      |        |          | 016-0047          | Wingrove & Rogers                    | C31-01/1   |
| C109      | 220pF   | Silver/Mica                  | 350V   | 2%       | 911-6839          | Lemco                                | 1106S      |
| C110      | 33pF    | Trimmer                      |        |          | 016-0047          | Wingrove & Rogers                    | C31-01/1   |
| C111      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C112      | 0.01μF  | Paper                        | 500V   | 20%      | 012-0123          | Hunt                                 | W97/BM21KV |
| C113      | 27pF    | Ceramic                      | 350V   | 5%       | 013-2279          | Lemco                                | 1106S      |
| C114      | 0.001μF | Ceramic                      | 350V   | +80%—20% |                   | Erie                                 | K350081/AD |
| C115      | 0.001μF | Ceramic                      | 350V   | +80%—20% | 914-9000          | "                                    | K3500/AD   |
| C116      | 33pF    | Silver/Mica (Assy. with L52) | 350V   | 5%       | 911-4291          | Lemco                                | 1106S      |

### 8.3 CAPACITORS (continued)

| <i>Cct.<br/>Ref.</i> | <i>Value</i>  | <i>Description</i>                    | <i>Rating</i> | <i>Tol.</i>   | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |              |
|----------------------|---------------|---------------------------------------|---------------|---------------|--------------------------|---|--------------|
| C117                 | 0.01 $\mu$ F  | Paper                                 | 500V          | 20%           | 5910-99-012-0123         | Hunt  | W97/BM21KV   |
| C118                 | 9.3pF         | Diff. trimmer                         |               |               | 972-8321                 | Oxley   | Mini trimmer |
| C119                 | 9.3pF         | Diff. trimmer                         |               |               | 972-8321                 | "   | Mini trimmer |
| C120                 | DELETED       |                                       |               |               |                          |   |              |
| C121                 | 220pF         | Silver/Mica                           | 350V          | 5%            | 911-6954                 | Lemco   | 1106S        |
| C122                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | Oxley   | A7/65        |
| C123                 | SEE C139      |                                       |               |               |                          |   |              |
| C124                 | 220pF         | Silver/Mica                           | 350V          | 5%            | 911-6954                 | Lemco   | 1106S        |
| C125                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | Oxley   | A7/65        |
| C126                 | SEE C139      |                                       |               |               |                          |   |              |
| C127                 | 150pF         | Silver/Mica                           | 350V          | 2%            | 972-9056                 | Lemco   | 1006S        |
| C127A                | 0.01 $\mu$ F  | Paper                                 | 500V          | 20%           | 012-0123                 | Hunt  | W97/BM21KV   |
| C128                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | Oxley   | A7/65        |
| C129                 | SEE C139      |                                       |               |               |                          |   |              |
| C129A                | 0.1 $\mu$ F   | Paper                                 | 350V          | 25%           | 011-5562                 | Hunt  | W49/B512KZ   |
| C130                 | 0.001 $\mu$ F | Ceramic                               | 350V          | +80%—20%      | 914-9000                 | Erie  | K3500/AD     |
| C130A                | 0.01 $\mu$ F  | Paper                                 | 500V          | 20%           | 012-0123                 | Hunt  | W97/BM21KV   |
| C131                 | 0.001 $\mu$ F | Ceramic                               | 350V          | +80%—20%      |                          | Erie  | K350081/AD   |
| C132                 | 0.001 $\mu$ F | Ceramic                               | 350V          | +80%—20%      |                          | "   | K350081/AD   |
| C133                 | 0.001 $\mu$ F | Ceramic                               | 350V          | +80%—20%      |                          | "   | K350081/AD   |
| C134                 | 2.2pF         | Ceramic                               | 750V          | $\pm 0.25$ pF | 972-8959                 | "   | N750K        |
| C135                 | 0.1 $\mu$ F   | Paper                                 | 350V          | 25%           | 011-5562                 | Hunt  | W49/B512KZ   |
| C136                 | 50pF          | Trimmer                               |               |               | 016-0004                 | Wingrove<br>& Rogers                            | C8-03        |
| C137                 | 270pF         | Silver/Mica                           | 350V          | 5%            |                          | Johnson<br>Matthey                              | C22R         |
| C138                 | DELETED       |                                       |               |               |                          |   |              |
| C139                 | 443pF         | Variable air<br>(4 Gang)              |               |               | 972-8958                 | Wingrove<br>& Rogers                            | C60-04/1     |
| C140                 | 0.05 $\mu$ F  | Paper                                 | 350V          | 25%           | 011-5559                 | Hunt  | W49/B511KZ   |
| C141                 | 0.05 $\mu$ F  | Paper                                 | 350V          | 25%           | 011-5559                 | "   | W49/B511KZ   |
| C142                 | 0.01 $\mu$ F  | Paper                                 | 500V          | 20%           | 012-0123                 | "   | W97/BM21KV   |
| C143                 | 220pF         | Silver/Mica                           | 350V          | 5%            | 911-6954                 | Lemco   | 1106S        |
| C144*                | 10pF          | Silver/Mica                           | 350V          | $\pm 1$ pF    |                          | "   | 1106S        |
| C144†                | 22pF          | Silver/Mica                           | 350V          | $\pm 1$ pF    |                          | "   | 1106S        |
| C145                 | 6800pF        | Silver/Mica                           | 350V          | 5%            | 972-8310                 | Hunt  | L4/37S       |
| C146                 | 270pF         | Silver/Mica                           | 350V          | 2%            |                          | Lemco   | 1106S        |
| C146A                | 100pF         | Ceramic                               | 350V          | 2%            | 911-6846                 | "   | 316N750      |
| C147                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | Oxley   | A7/65        |
| C148                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | "   | A7/65        |
| C149                 | 0.001 $\mu$ F | Ceramic                               | 350V          | +80%—20%      | 914-9000                 | Erie  | K350081/AD   |
| C150                 | 0.1 $\mu$ F   | Paper                                 | 150V          | 25%           | 011-5560                 | Hunt  | W49/B500KY   |
| C151                 | 0.001 $\mu$ F | Ceramic                               | 350V          | +80%—20%      | 914-9000                 | Erie  | K350081/AD   |
| C152                 | 290pF         | Silver/Mica                           | 350V          | 2%            |                          | Lemco   | 1106S        |
| C152A                | 100pF         | Ceramic                               | 750V          | 2%            |                          | "   | 316N750      |
| C153                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | Oxley   | A7/65        |
| C154                 | 0.25 $\mu$ F  | Paper                                 | 150V          | 25%           | 011-5563                 | Hunt  | W49/B501KZ   |
| C155                 | 0.05 $\mu$ F  | Paper                                 | 350V          | 25%           | 011-5559                 | "   | W49/B511KZ   |
| C156                 | 0.01 $\mu$ F  | Paper                                 | 500V          | 20%           | 012-0123                 | "   | W97/BM21KV   |
| C157                 | 290pF         | Silver/Mica                           | 350V          | 2%            |                          | Lemco   | 1106S        |
| C157A                | 100pF         | Ceramic                               | 750V          | 2%            |                          | "   | 316N750      |
| C158                 | 70pF          | Trimmer, 12 vane<br>with acetate case |               |               | 972-8320                 | Oxley   | A7/65        |

### 8.3 CAPACITORS (continued)

| Cct.<br>Ref. | Value   | Description                           | Rating | Tol.     | Joint Service No. | Manufacturer and<br>Type or Drawing No. |                      |
|--------------|---------|---------------------------------------|--------|----------|-------------------|---|----------------------|
| C159         | 0.05μF  | Paper                                 | 350V   | 25%      | 5910-99-011-5559  | Hunt                                    | W49/B511KZ           |
| C159A        | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | "                                       | W49/B500KY           |
| C159B        | 0.001μF | Ceramic                               | 350V   | +80%—20% |                   | Erie                                    | K350081/AD           |
| C160         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | Hunt                                    | W49/B511KZ           |
| C161         | 290pF   | Silver/Mica                           | 350V   | 2%       |                   | Lemco                                   | 1106S                |
| C161A        | 100pF   | Ceramic                               | 750V   | 2%       |                   | "                                       | 416N750              |
| C162         | 70pF    | Trimmer, 12 vane<br>with acetate case |        |          | 972-8320          | Oxley                                   | GA7/65               |
| C163         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | Hunt                                    | W49/B511KZ           |
| C164         | 330pF   | Silver/Mica                           | 350V   | 5%       | 580-2350          | Lemco                                   | 1106S                |
| C165         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | Hunt                                    | W49/B511KZ           |
| C166         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| C167         | 470pF   | Silver/Mica                           | 350V   | 5%       | 972-8962          | Lemco                                   | 1106S                |
| C168         | 10pF    | Ceramic                               | 750V   | 5%       | 013-2425          | Erie                                    | P100K                |
| C169         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | Hunt                                    | W49/B500KY           |
| C170         | 2700pF  | Silver/Mica                           | 350V   | 5%       | 972-8309          | "                                       | L4/37S               |
| C170A        | 33pF    | Silver/Mica                           | 350V   | 5%       | 941-4291          | Lemco                                   | 1106S                |
| C171         | 70pF    | Trimmer, 12 vane<br>with acetate case |        |          | 972-8320          | Oxley                                   | A7/65                |
| C172         | 120pF   | Silver/Mica                           | 350V   | 2%       |                   | Lemco                                   | 1106S                |
| C173         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | Hunt                                    | W49/B500KY           |
| C174         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| C175         | 33pF    | Ceramic                               | 750V   | 5%       | 013-2282          | Erie                                    | N750K                |
| C176         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | Hunt                                    | W49/B500KY           |
| C177         | 100pF   | Silver/Mica                           | 350V   | 5%       | 911-6953          | Lemco                                   | 1106S                |
| C178         | 10pF    | Ceramic                               | 750V   | 5%       | 013-2425          | Erie                                    | P100K                |
| C179         | 70pF    | Trimmer, 12 vane<br>with acetate case |        |          | 972-8320          | Oxley                                   | A7/65                |
| C180         | 100pF   | Silver/Mica                           | 350V   | 2%       |                   | Lemco                                   | 1106S                |
| C181         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | Hunt                                    | W49/B511KZ           |
| C182         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | "                                       | W49/B500KY           |
| C183         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| V184         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| C185         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | "                                       | W49/B500KY           |
| C186         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| C187         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| C188         | 0.05μF  | Paper                                 | 350V   | 25%      | 011-5559          | "                                       | W49/B511KZ           |
| C188A        | 1μF     |                                       | 150V   | 25%      | 011-5569          | "                                       | W49/B503KY           |
| C189         | 0.01μF  | Paper                                 | 500V   | 20%      | 012-0123          | "                                       | W97/BM21KY           |
| C190         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | "                                       | W49/B500KY           |
| C191         | 70pF    | Trimmer, 12 vane<br>with acetate case |        |          | 972-8320          | Oxley                                   | A7/65                |
| C192         | 390pF   | Silver/Mica                           | 350V   | 2%       |                   | Lemco                                   | 1106S                |
| C193         | 100pF   | Ceramic                               | 750V   | 10%      | 011-2300          | Erie                                    | N750L                |
| C193A        | 0.001μF | Ceramic                               | 350V   | +80%—20% |                   | "                                       | K350081/AD           |
| C194         | 0.1μF   | Paper                                 | 150V   | 25%      | 011-5560          | Hunt                                    | W49/B500KY           |
| C194A        | 0.001μF | Ceramic                               | 350V   | +80%—20% | 914-9000          | Erie                                    | K3500/AD             |
| C195         | 0.1μF   | Paper                                 | 350V   | 25%      | 011-5562          | Hunt                                    | W49/B512KZ           |
| C195A        | 390pF   | Silver/Mica                           | 350V   | 2%       |                   | Lemco                                   | 1106S                |
| C195B        | 70pF    | Trimmer, 12 vane<br>with acetate case |        |          | 972-8320          | Oxley                                   | A7/65                |
| C196         | 0.5μF   | Paper                                 | 150V   | 25%      | 011-5566          | Hunt                                    | W49/B502KY           |
| C197         | 100μF   | Electrolytic                          | 50V    |          | 014-5515          | "                                       | L37/1 85° C<br>JF104 |
| C198         | 32+32μF | Electrolytic<br>(see C206)            | 350V   |          | 972-8308          | Plessey                                 | CE818 85° C          |
| C199         | 220pF   | Silver/Mica                           | 350V   | 5%       | 911-6954          | Lemco                                   | 1106S                |
| C200         | 50pF    | Variable                              |        |          |                   | Racal                                   | AD.15051             |
| C201         | 70pF    | Trimmer, 12 vane<br>with acetate case |        |          | 972-8320          | Oxley                                   | A7/65                |

## 8.6 VALVES (British)

| <i>Cct.<br/>Ref.</i> | <i>Description</i> | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |
|----------------------|--------------------|--------------------------|---|
| V1                   | Pentode            | CV138                    | EF91  |
| V2                   | Pentode            | CV138                    | EF91  |
| V3                   | Double-Triode      | CV5531                   | ECC189  |
| V4                   | Pentode            | CV2209                   | 6F33  |
| V5                   | Pentode            | CV138                    | EF91  |
| V6                   | Pentode            | CV138                    | EF91  |
| V7                   | Pentode            | CV3998                   | E180F   |
| V8                   | Pentode            | CV138                    | EF91  |
| V9                   | Pentode            | CV3998                   | E180F   |
| V10                  | Pentode            | CV138                    | EF91  |
| V11                  | Heptode            | CV4012                   | 6BE6W   |
| V12                  | Pentode            | CV138                    | EF91  |
| V13                  | Heptode            | CV4012                   | 6BE6W   |
| V14                  | Pentode            | CV454                    | EF93  |
| V15                  | Pentode            | CV454                    | EF93  |
| V16                  | Pentode            | CV454                    | EF93  |
| V17                  | Pentode            | CV454                    | EF93  |
| V18                  | Double-Diode       | CV140                    | EB91  |
| V19                  | Pentode            | CV138                    | EF91  |
| V20                  | F.W. Rectifier     | CV1377                   | GZ34  |
| V21                  | Double-Diode       | CV140                    | EB91  |
| V22                  | Pentode            | CV138                    | EF91  |
| V23                  | Pentode            | CV138                    | EF91  |
| V24                  | Diode              | CV469                    | EA76  |

## 8.7 VALVES (American)

|     |                |        |             |
|-----|----------------|--------|-------------|
| V1  | Pentode        | CV2524 | 6AU6        |
| V2  | Pentode        | CV2524 | 6AU6        |
| V3  | Double-Triode  |        | 6ES8/ECC189 |
| V4  | Pentode        | CV2522 | 6AS6        |
| V5  | Pentode        | CV2524 | 6AU6        |
| V6  | Pentode        | CV2524 | 6AU6        |
| V7  | Pentode        | CV3998 | 6688/E180F  |
| V8  | Pentode        | CV2524 | 6AU6        |
| V9  | Pentode        | CV3998 | 6688/E180F  |
| V10 | Pentode        | CV2524 | 6AU6        |
| V11 | Heptode        | CV4012 | 6BE6W       |
| V12 | Pentode        | CV2524 | 6AU6        |
| V13 | Heptode        | CV4012 | 6BE6W       |
| V14 | Pentode        | CV454  | 6BA6        |
| V15 | Pentode        | CV454  | 6BA6        |
| V16 | Pentode        | CV454  | 6BA6        |
| V17 | Pentode        | CV454  | 6BA6        |
| V18 | Double-Diode   | CV283  | 6AL5        |
| V19 | Pentode        | CV2524 | 6AU6        |
| V20 | DELETED        |        |             |
| V21 | Double-Diode   | CV283  | 6AL5        |
| V22 | Output-Tetrode | CV1862 | 6AQ5        |
| V23 | Double triode  | CV455  | 12AT7       |
| V24 | Diode          | CV469  | 5704/EA76   |

(fitted from Ser. No. 3737)

## 8.8 VALVE AND CRYSTAL HOLDERS

|              |                |                  |         |       |
|--------------|----------------|------------------|---------|-------|
| XL1*         | Crystal Holder | 5935-99-911-6489 | McMurdo | X2/UG |
| XL2, XL3     | Valve Holder   | 5935-99-056-0127 | "       | —     |
| XL5 and XL6  | Screening Can  | 5960-99-056-3005 | "       | —     |
| XL1 to XL3†  | Crystal Holder |                  | "       | X2/UG |
| XL5 and XL6† |                |                  |         |       |

## 8.8 VALVE AND CRYSTAL HOLDERS (continued)

| <i>Cct.<br/>Ref.</i> | <i>Description</i>   | <i>Joint Service No.</i> | <i>Manufacturer Type<br/>Type or Drawing No.</i> |         |
|----------------------|----------------------|--------------------------|--|---------|
| V1 and               | Valve Holder         | 5935-99-056-0127         | McMurdo  | —       |
| V2                   | Screening Can        | 5960-99-056-3003         | "  | —       |
| V3                   | Valve Holder         | 5935-99-056-0131         | "  | —       |
|                      | Screening Can        | 5960-99-056-3007         | "  | —       |
| V4*                  | Valve Holder         | 5935-99-056-0127         | "  | —       |
| *                    | Screening Can        | 5960-99-056-3003         | "  | —       |
| V4†                  | Valve Holder         | 5935-99-056-0127         | "  | —       |
| †                    | Screening Can        | 5960-99-056-0145         | "  | —       |
| V5 and               | Valve Holder         | 5935-99-056-0127         | "  | —       |
| V6                   | Screening Can        | 5960-99-056-3003         | "  | —       |
| V7                   | Valve Holder         | 5935-99-056-0131         | "  | —       |
|                      | Screening Can        | 5960-99-056-0146         | "  | —       |
| V8                   | Valve Holder         | 5935-99-056-0127         | "  | —       |
|                      | Screening Can        | 5960-99-056-3003         | "  | —       |
| V9                   | Valve Holder         | 5935-99-056-0131         | "  | —       |
|                      | Screening Can        | 5960-99-056-0146         | "  | —       |
| V10 to               | Valve Holder         | 5935-99-056-0127         | "  | —       |
| V19                  | Screening Can        | 5960-99-056-3003         | "  | —       |
| V20*                 | Valve Holder         | 5935-99-056-0149         | "  | X8/U    |
|                      | Valve Retainer       |                          | Electrothermal                                   | VR10    |
| V20†                 | DELETED              |                          |  |         |
| V21                  | Valve Holder         | 5935-99-056-0127         | McMurdo  | —       |
|                      | Screening Can        | 5960-99-056-3003         | "  | —       |
| V22*                 | Valve Holder         | 5935-99-056-0127         | "  | —       |
|                      | Screening Can        | 5960-99-056-3003         | "  | —       |
| V22†                 | Valve Holder         | 5935-99-056-0127         | "  | —       |
|                      | Screening Can        | 5906-99-056-3005         | "  | —       |
| V23*                 | Valve Holder         | 5935-99-056-0127         | "  | —       |
|                      | Screening Can        | 5960-99-056-3003         | "  | —       |
| V23†                 | Valve Holder         | 5935-99-056-0131         | "  | —       |
|                      | Screening Can        | 5960-99-056-3007         | "  | —       |
| V24                  | Diode Retaining Clip |                          | Sealectro  | B-B0147 |

## 8.9 INDUCTANCES

|      |                          |                  |       |         |
|------|--------------------------|------------------|-------|---------|
| L1   | 0-30 Mc/s filter         | 5950-99-972-9552 | Racal | BD4586  |
| L2   | Crystal anode coil       | 5950-99-972-9565 | "     | AA4768  |
| L3   | Common assembly with L1  |                  | "     | BA14099 |
| L4*  | Aerial Tuning            |                  | "     | BA14986 |
| L4†  | Coil Assembly 16-30 Mc/s |                  | "     | BA14098 |
| L5*  | Aerial Tuning            |                  | "     | BA14985 |
| L5†  | Coil Assembly 8-16 Mcs.  |                  | "     | BA14097 |
| L6*  | Aerial Tuning            |                  | "     | BA14984 |
| L6†  | Coil Assembly 4-8 Mc/s   |                  | "     | BA14096 |
| L7*  | Aerial Tuning            |                  | "     | BA14983 |
| L7†  | Coil Assembly 2-4 Mc/s   |                  | "     | BA14095 |
| L8*  | Aerial Tuning            |                  | "     | BA14982 |
| L8†  | Coil Assembly 1-2 Mc/s   |                  | "     | BA14094 |
| L9*  | Aerial Tuning            |                  | "     | BA14981 |
| L9†  | Coil Assembly 0.5-1 Mc/s |                  | "     |         |
| L10  | Common assembly with L1  |                  |       |         |
| L11  | Common assembly with L1  |                  |       |         |
| L12  | Common assembly with L1  |                  |       |         |
| L13* | Harmonic filter          | 5950-99-972-9553 | "     | AD4589  |
| L13† | Filter Detail Assembly   |                  | "     | AD13715 |
| L14  | Common assembly with L13 |                  |       |         |
| L15  | Common assembly with L1  |                  |       |         |
| L16  | Common assembly with L13 |                  |       |         |
| L17  | Common assembly with L1  |                  |       |         |

## 8.9 INDUCTANCES (continued)

| <i>Cct.<br/>Ref.</i> | <i>Description</i>            | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |                |
|----------------------|-------------------------------|--------------------------|---|----------------|
| L62                  | Common assembly with L61      |                          | Racal   | AA14988        |
| L63*                 | Second L-C filter stage       |                          |   | AA15577        |
| L63†                 | Second L-C filter stage       |                          | "   |                |
| L64                  | Common assembly with L63      |                          |   |                |
| L65                  | Choke                         | 5950-99-972-8084         | "   | AD16987        |
| L66                  | Filter coil                   | 972-9555                 | "   | AA4655         |
| L67*                 | Third L-C filter stage        |                          | "   | AA14988        |
| L67†                 | Third L-C filter stage        |                          | "   | AA15577        |
| L68                  | Common assembly with L67      |                          |   |                |
| L69                  | 0.1 Mc/s coupling coil        | 5950-99-972-9574         | "   | AA4777         |
| L70                  | Common assembly with L69      | 972-9574                 | "   | AA4777         |
| L71*                 | Final L-C filter stage        | 972-9578                 | "   | BA4843         |
| L71†                 | Final L-C filter stage        |                          | "   | BA13820        |
| L72* }               | 100 kc/s i.f. first stage     |                          | "   | pt. of BA10892 |
| L73*                 |                               |                          |   |                |
| L74*                 |                               |                          |   |                |
| L72† }               | 100 kc/s i.f. first stage     |                          | "   | pt. of BA15585 |
| L73†                 |                               |                          |   |                |
| L74†                 |                               |                          |   |                |
| L75                  | 0.9 Mc/s anode coil           | 5950-99-972-9576         | "   | AA4779         |
| L76*                 | I.F. output                   |                          | "   | pt. of BA4783  |
| L76†                 | I.F. output Transformer assy. |                          | "   | pt. of BA13819 |
| L77* }               | 100 kc/s i.f. final stage     |                          | "   | pt. of BA4942  |
| L78*                 |                               |                          |   |                |
| L79*                 |                               |                          |   |                |
| L77† }               | 100 kc/s i.f. final stage     |                          | "   | pt. of BA13822 |
| L78†                 |                               |                          |   |                |
| L79†                 |                               |                          |   |                |
| L80*                 | Smoothing choke               | 5950-99-972-8943         | "   | T1081          |
| L80†                 | Smoothing choke               |                          | "   | BT15422        |
| L81*                 | 150mH choke                   | 972-9561                 | "   | pt. of AA4762  |
| L81†                 | 150mH choke                   |                          | "   | AA13761        |
| L82                  | B.F.O.                        |                          | "   | AA14150        |
| L83                  | Filter coil (Aerial)          | 911-0554                 | "   | AA10420        |
| L84                  | Filter coil (Aerial)          | 911-0554                 | "   | AA10420        |
| L85                  | Filter coil (Aerial)          | 911-0554                 | "   | AA10420        |
| L86*                 | R.F. choke                    | 972-8084                 | "   | AD16987        |
|                      | (fitted from Ser. No. 3737)   |                          |   |                |
| L86†                 | R.F. choke                    | 972-8084                 | "   | AD16987        |

## 8.10 TRANSFORMERS

|     |                  |                  |                                  |         |
|-----|------------------|------------------|----------------------------------|---------|
| T1* | Mains            | 5950-99-911-6456 | Racal                            | T1078   |
| T1† | Mains            |                  | "                                | BT15421 |
|     |                  |                  | (Canadian Atlas Trans. Co. Ltd.) |         |
| T2* | Audio Output     | 911-6455         | Racal                            | T1079   |
| T2† | Audio Output     |                  | "                                | BT15423 |
|     |                  |                  | (Canadian Atlas Trans. Co. Ltd.) |         |
| T3* | A.F. Line Output | 911-6454         | Racal                            | T1080   |
| T3† | A.F. Line Output |                  | "                                | BT15424 |
|     |                  |                  | (Canadian Atlas Trans. Co. Ltd.) |         |

## 8.11 RECTIFIERS

|        |                              |                  |             |        |
|--------|------------------------------|------------------|-------------|--------|
| MR1    | Meter Rectifier              | 6130-99-943-6183 | S.E.I. Ltd. | 1mA.   |
| MR4 to | Metal Rectifier              |                  | A.E.I.      | SJ401B |
| MR7    |                              |                  |             |        |
| MR8*   | Germanium Diode              |                  | G.E.C.      | GEX54  |
|        | (fitted up to Ser. No. 3736) |                  |             |        |

## 8.12 LOUDSPEAKERS

| <i>Cct.<br/>Ref.</i> | <i>Description</i> | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |              |
|----------------------|--------------------|--------------------------|---|--------------|
| *                    | 2½" P.M. 3Ω        | 5965-99-972-9307         | Goodmans  | T24/201/3    |
| †                    | 2½" sq. 3Ω         |                          | Racal   | AD15398      |
|                      |                    |                          | N.A. ref. Marsland                              |              |
|                      |                    |                          | Eng. Ltd.                                       | Model LS.201 |

## 8.13 METERS

|     |                     |                  |                            |          |
|-----|---------------------|------------------|----------------------------|----------|
| M1* | 200 microamp F.S.D. | 6625-99-943-6523 | Ernest Turner              | W909     |
|     |                     |                  | (with AD4868f Scale)       |          |
| M1† | 200 microamp        |                  | Racal                      | AD15397  |
|     |                     |                  | N.A. ref. Stark Electronic |          |
|     |                     |                  | Instruments                | Type     |
|     |                     |                  |                            | MR26W200 |

## 8.14 CRYSTALS

|      |                           |                  |                 |          |
|------|---------------------------|------------------|-----------------|----------|
| XL1* | 1 Mc/s $\pm 0.005\%$      | ZDK 1000 kc/s    | Racal           | BD 7822  |
| XL1† | 1 Mc/s $\pm 0.005\%$      |                  | "               | BD15378  |
|      |                           |                  | C. R. Snelgrove | Co. Ltd. |
| XL2* | 100,036 c/s $\pm 0.005\%$ | 5955-99-972-9799 | Racal           | BD7929   |
| XL2† | 100,036 c/s $\pm 0.005\%$ |                  | "               | BD15373  |
|      |                           |                  | C. R. Snelgrove | Co. Ltd. |
| XL3* | 100,110 c/s $\pm 0.005\%$ | 5955-99-972-9801 | Racal           | BD7931   |
| XL3† | 100,110 c/s $\pm 0.005\%$ |                  | "               | BD15372  |
|      |                           |                  | C. R. Snelgrove | Co. Ltd. |
| XL4  | DELETED                   |                  |                 |          |
| XL5* | 99,964 c/s $\pm 0.005\%$  | 5955-99-972-9800 | Racal           | BD7930   |
| XL5† | 99,964 c/s $\pm 0.005\%$  |                  | "               | BD15371  |
|      |                           |                  | C. R. Snelgrove | Co. Ltd. |
| XL6* | 99,890 c/s $\pm 0.005\%$  | 5955-99-972-9802 | Racal           | BD7932   |
| XL6† | 99,890 c/s $\pm 0.005\%$  |                  | "               | BD15369  |
|      |                           |                  | C. R. Snelgrove | Co. Ltd. |

## 8.15 FUSES AND FUSEHOLDERS

|     |                         |                  |             |          |
|-----|-------------------------|------------------|-------------|----------|
| F1  | Mains Fuse, 2A          | 5920-99-059-0110 | Belling Lee | L/1055   |
|     | Mains Fuseholder        | 5920-99-059-0100 | " "         | L/1348   |
| F2* | HT Fuse, 350mA, size 00 | 5920-99-972-7902 | " "         | L/562    |
|     | HT Fuseholder           | 5950-99-059-0170 | " "         | L/575    |
| F2† | Fuse slow blow 350mA    |                  | K. Beswick  | TDA12/19 |
|     | Fuseholder              | 5920-99-059-0100 | Belling Lee | L356     |

## 8.16 LAMP AND HOLDER

|      |                          |                  |  |                |
|------|--------------------------|------------------|--|----------------|
| ILP1 | Mains indicating 8V 1.6W | 6240-99-995-1201 |  | M.E.S.11mm Rd. |
|      | Lampholder               | 6520-99-943-6863 |  | M.E.S.5S       |

## 8.17 VOLTAGE SELECTORS

|                                    |                  |       |            |
|------------------------------------|------------------|-------|------------|
| *Voltage selector socket with plug | 5935-99-911-0472 | Racal | AD11999A&B |
| *Voltage selector plug             | 5935-99-911-0472 | "     | AD11999/A  |
| *Voltage selector socket           |                  | "     | AD11999/B  |

## 8.18 SUPPLEMENTARY COMPONENTS AND SUB-ASSEMBLIES

|                                      |                  |               |           |
|--------------------------------------|------------------|---------------|-----------|
| Audio Output Terminal Block (12-way) | 5940-99-943-8586 | Carr Fastener | Series    |
| H.T. Adaptor Terminal Block (2-way)  | 5940-99-943-8587 | " "           | 77/903/12 |
| Knobs, tuning (Mc/s and kc/s)        | 5355-99-943-4816 | Racal         | Series    |
|                                      |                  |               | 77/903/2M |
|                                      |                  |               | BD6781    |

# 8.18 SUPPLEMENTARY COMPONENTS AND SUB-ASSEMBLIES (continued)

| <i>Cct.<br/>Ref.</i> | <i>Description</i>   | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |            |
|----------------------|--|--------------------------|---|------------|
|                      | Knobs, control<br>(AE. TUNE and I.F. GAIN)                                       | 5355-99-943-4818         | Racal   | AA6817     |
|                      | Knobs, control<br>(A.V.C. and A.F. GAIN)   | 5355-99-943-4819         | "   | AA6742     |
|                      | *Knobs, control<br>(AE. ATT., AE. RANGE,<br>BANDWIDTH and System)                |                          | "   | AA15472    |
|                      | †Knobs, control<br>(METER, ANT. ATT. and ANT.<br>RANGE, BANDWIDTH and<br>System) |                          | "   | BA13828    |
|                      | Knob, control (B.F.O.)   |                          | "   | AD13592    |
|                      | Skirt (B.F.O. knob)  |                          | "   | AD15049    |
|                      | *Knob, tuning lock   | 5355-99-943-4820         | "   | AD6762     |
|                      | †Knob, tuning lock   |                          | "   | AD13784    |
|                      | Chain (63 links)   | 4010-99-911-0581         | "   | AD4641     |
|                      | Escutcheon, tuning with windows  | 5820-99-943-0550         | "   | BA12009    |
|                      | *Escutcheon, loudspeaker   | 5965-99-972-9121         | "   | AD4848     |
|                      | †Escutcheon, loudspeaker   |                          | "   | AD13771    |
|                      | Slider (kc/s tuning)   | 5355-99-943-5043         | "   | AD4568     |
|                      | Clip and pointer assy. (kc/s tuning)   | 5355-99-943-5020         | "   | AA4566     |
|                      | Film scale   | 5820-99-943-5022         | "   | BD9562     |
|                      | *Cable, UR70   | 5355-99-6145-100298      | "   | CA10828/46 |
|                      | †Cable, UR70   | 5355-99-6145-100298      | "   | CA13876/46 |
|                      | *Trimming tool (AD7955)  | 5120-99-911-0558         | "   | DA4500/65  |
|                      | †Trimming tool (AD7955)  | 5120-99-911-0558         | "   | DA13971/65 |
|                      | *Allen Key $\frac{1}{8}$ " A.F.  | 5120-99-910-6085         | "   | DA4500/66  |
|                      | †Allen Key $\frac{1}{8}$ " A.F.  | 5120-99-910-6058         | "   | DA13971/66 |
|                      | *Allen Key $\frac{1}{8}$ " A.F.  |                          | "   | DA4500/67  |
|                      | †Allen Key $\frac{1}{8}$ " A.F.  |                          | "   | DA13971/67 |
|                      | *Allen Key 0.050" A.F.   | 5120-99-910-6057         | "   | DA4500/69  |
|                      | †Allen Key 0.050" A.F.   |                          | "   | DA13971/69 |
|                      | Cabinet  | 5957-99-972-8566         | "   | DA15476    |
|                      | Cover assembly   | 5820-99-943-5048         | "   | CA4640     |
|                      | Baseplate  |                          | "   | BD4580     |
|                      | *Gusset Assembly R.H.  | 5820-99-943-5021         | "   | BA4509     |
|                      | †Gusset Assembly R.H.  |                          | "   | BA13803    |
|                      | *Gusset Assembly L.H.  | 5820-99-943-5049         | "   | BA4508     |
|                      | †Gusset Assembly L.H.  |                          | "   | BA13802    |
|                      | Screen Assembly<br>(37.5 Mc/s Filter—long)                                       | 5999-99-972-8946         | "   | BA4602     |
|                      | Screen Assembly<br>(37.5 Mc/s Filter—short)                                      | 5999-99-972-8947         | "   | BA4603     |
|                      | Screen Assembly (2nd mixer)  | 5999-99-972-8948         | "   | BA4604     |
|                      | Screen Assembly<br>(40 Mc/s Filter—long)   | 5999-99-972-8949         | "   | BA4605     |
|                      | Screen Assembly<br>(40 Mc/s Filter—short)  | 5999-99-972-8950         | "   | BA4606     |
|                      | Screen Assembly (Harm. Gen.)   | 5999-99-972-8951         | "   | BA4560     |
|                      | Screen Assembly (Ac. Att. Sw.)   | 5999-99-972-8952         | "   | AA4755     |
|                      | *Screen Assembly (1st v.f.o.)  | 5999-99-972-8944         | "   | CA4582L    |
|                      | †Screen Assembly (1st v.f.o.)  |                          | "   | CA13832    |
|                      | *Screen Assembly (2nd v.f.o.)  | 5999-99-972-8945         | "   | BA4581L    |
|                      | †Screen Assembly (2nd v.f.o.)  |                          | "   | BA13805    |
|                      | *First I.F.T. assembly   |                          | "   | BA10892L   |
|                      | †First I.F.T. assembly   |                          | "   | BA15585C12 |
|                      | *Final I.F.T. assembly   | 5999-99-940-3480         | "   | BA4942L    |
|                      | †Final I.F.T. assembly   |                          | "   | BA13822C12 |
|                      | *I.F. O/P T. assembly  | 5999-99-940-3482         | "   | BA4783L    |



## 8.18 SUPPLEMENTARY COMPONENTS AND SUB-ASSEMBLIES (continued)

| <i>Cct.<br/>Ref.</i> | <i>Description</i>            | <i>Joint Service No.</i> | <i>Manufacturer and<br/>Type or Drawing No.</i> |            |
|----------------------|-------------------------------|--------------------------|---|------------|
|                      | †I.F. O/P T. assembly         |                          | Racal   | BA13819C12 |
|                      | *B.F.O. assembly              | 5905-99-913-1761         | "   | CA4802L    |
|                      | †B.F.O. assembly              |                          | "   | CA13855C12 |
|                      | *Crystal Filter assembly      | 5999-99-914-1805         | "   | CA4800L    |
|                      | †Crystal Filter assembly      |                          | "   | CA13853C12 |
|                      | *L-C Filter assembly          | 5999-99-914-1804         | "   | CA4801L    |
|                      | †L-C Filter assembly          |                          | "   | CA13854C12 |
|                      | *Ac. Att. switch              | 5805-99-972-6897         | "   | BA10833L   |
|                      | †ANT. Att. switch             |                          | "   | BA13826C12 |
|                      | Ferroxcube Bead               | 5999-99-100-2634         | "   | FX1115     |
|                      | Label-self adhesive (Warning) |                          |   |            |
|                      | one section                   | 9905-99-972-7468         | "   | BD4940B    |
|                      | Label-self adhesive (Warning) |                          |   |            |
|                      | Two sections                  | 9905-99-972-7467         | "   | BD4940A    |
|                      | *Film Spool (grey plastic)    | 6760-99-949-0634         | "   | BD12437    |
|                      | †Film Spool (grey plastic)    |                          | "   | BD13827    |

## 8.19 MAIN SUB-UNITS

|  |                                    |                  |   |            |
|--|------------------------------------|------------------|---|------------|
|  | Main chassis assembly              |                  | " |            |
|  | (with screening covers)            | 5820-99-580-1293 | " | AA18182    |
|  | *First V.F.O. (Mc/s Drive)         | 5820-99-913-1498 | " | CA14182L   |
|  | †First V.F.O. (Mc/s Drive)         |                  | " | CA14980C12 |
|  | *Second V.F.O. (kc/s Drive)        | 5820-99-943-3459 | " | CA10828L   |
|  | †Second V.F.O. (kc/s Drive)        |                  | " | CA13876C12 |
|  | *100 kc/s i.f. strip (inc. B.F.O.) | 5820-99-913-1497 | " | CA10884L   |
|  | †100 kc/s i.f. strip (inc. B.F.O.) |                  | " | CA13879C12 |
|  | *Crystal calibrator unit           | 6625-99-943-3461 | " | CA10845L   |
|  | †Crystal calibrator unit           |                  | " | CA13880C12 |
|  | *Front Panel Assembly              |                  | " | CA4833L    |
|  | †Front Panel Assembly              |                  | " | CA13871C12 |

*Note:* For the RA.17C-12, U.N.C. threads are used on both of the output terminal blocks.

